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SIGNAL

AFCEA
Eleventh Convention Issue

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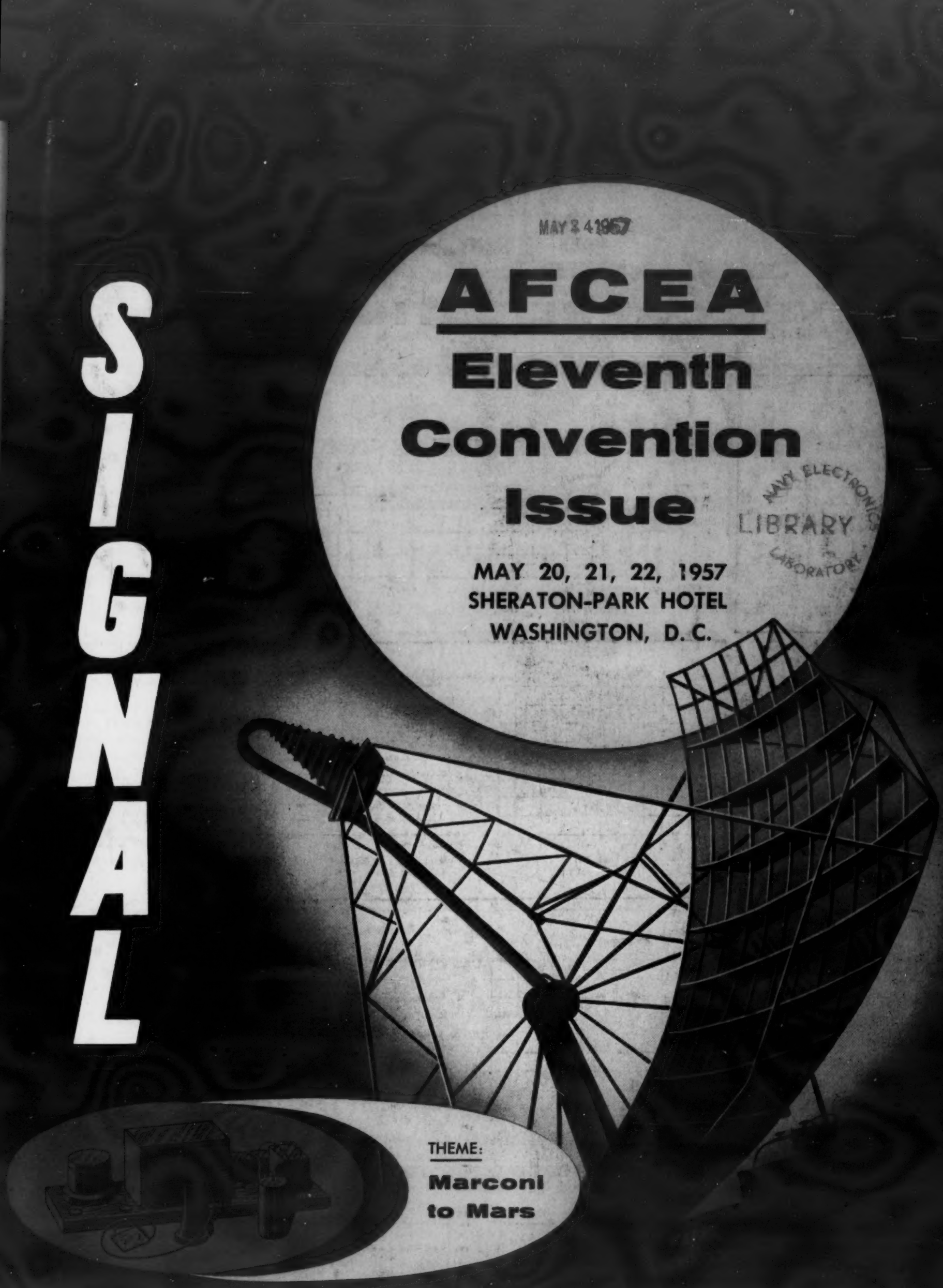


THEME:
Marconi to Mars

Communications—Electronics—Photography MAY 1957

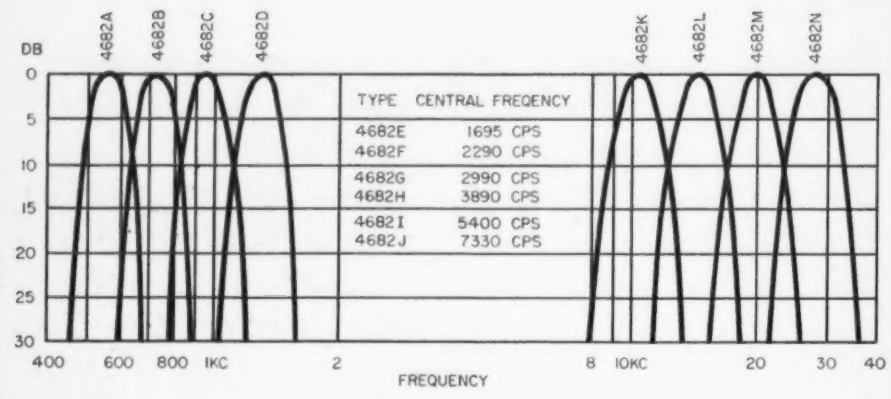
SOUVENIR PROGRAM

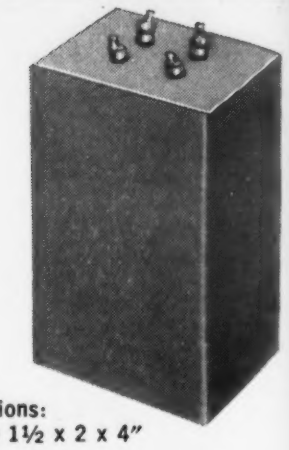
OUR MILLIONTH FILTER SHIPPED THIS YEAR...

FILTERS
FOR EVERY APPLICATION

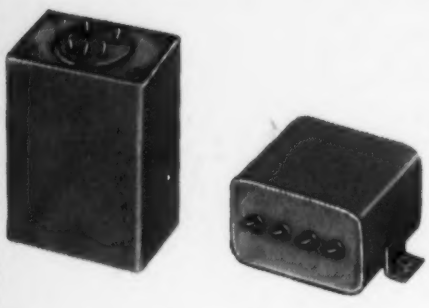
TELEMETERING FILTERS

UTC manufactures a wide variety of band pass filters for multi-channel telemetering. Illustrated are a group of filters supplied for 400 cycle to 40 KC service. Miniaturized units have been made for many applications. For example a group of 4 cubic inch units which provide 50 channels between 4 KC and 100 KC.

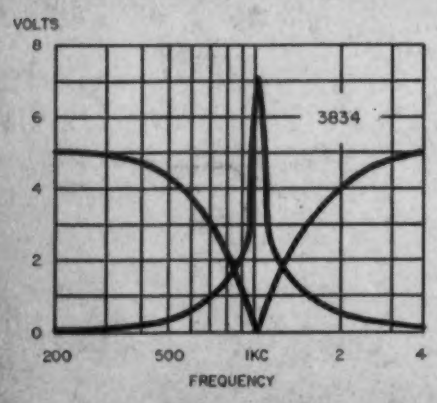


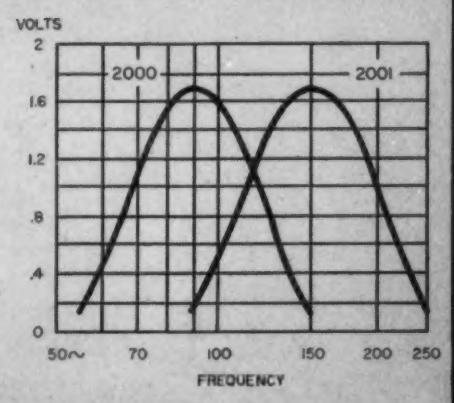


Dimensions:
(4682A) 1½ x 2 x 4"



Dimensions:
(3834) 1¼ x 1¾ x 2-3/16".
(2000, 1) 1¼ x 1¾ x 1⅝".





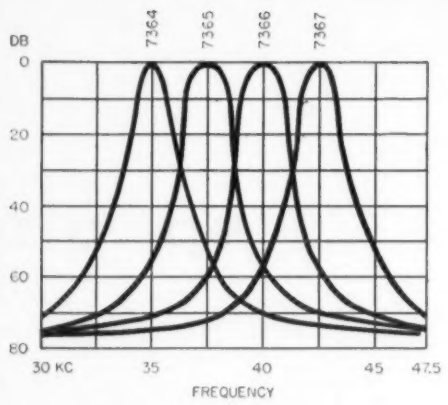
AIRCRAFT FILTERS

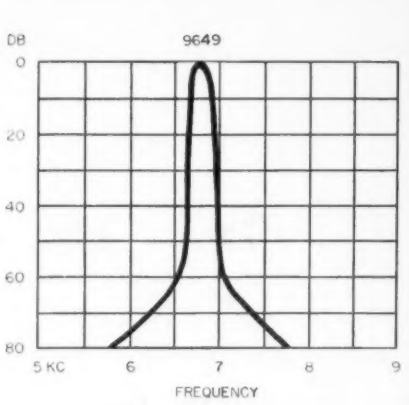
UTC has produced the bulk of filt used in aircraft equipment for o a decade. The curve at the left that of a miniaturized (1020 cycl range filter providing high atten tion between voice and range f quencies.

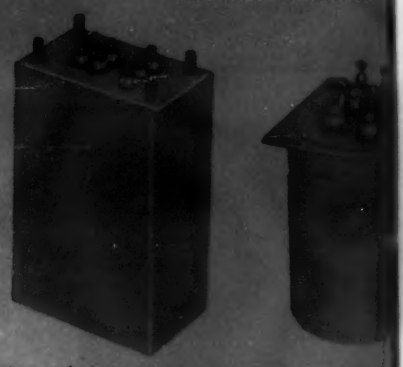
Curves at the right are that of c miniaturized 90 and 150 cycle filte for glide path systems.

CARRIER FILTERS

A wide variety of carrier filters are available for specific applications. This type of tone channel filter can be supplied in a varied range of band widths and attenuations. The curves shown are typical units.



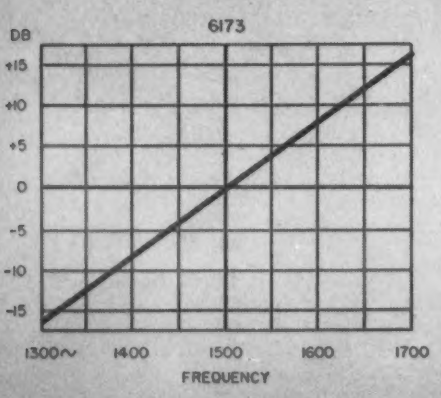


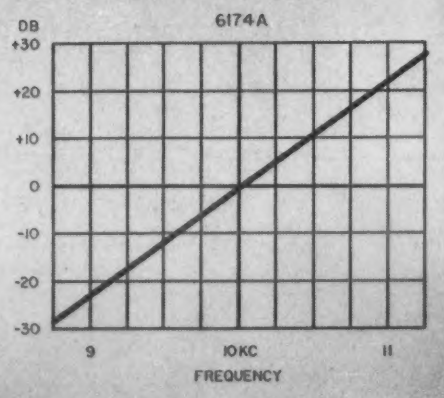


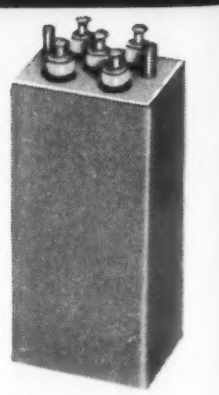
Dimensions:
(7364 series) 1⅝ x 1⅝ x 2¼".
(9649) 1½ x 2 x 4".

DISCRIMINATORS

These high Q discriminators provide exceptional amplification and linearity. Typical characteristics available are illustrated by the low and higher frequency curves shown.







Dimensions:
(6173) 1-1/16 x 1⅜ x 3".
(6174A) 1 x 1¼ x 2¼".

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BPA

SIGNAL

Communications-Electronics-Photography

Journal of the Armed Forces Communications and Electronics Association

VOLUME XI MAY 1957 NUMBER 9

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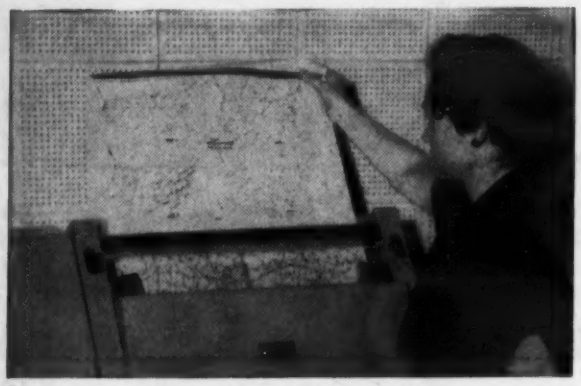
ALFAX *opens new horizons in Facsimile Communication and Instrumentation*
FOR THE ARMED SERVICES

Serious people all over the world are now learning first hand the new possibilities opened up by Alfax Paper FROM speeding idea transmission with least possible circuit time and reorganizing of information TO unveiling full resolution of electronic instruments, computers, and detection devices.

FORECASTERS ENTHUSIASTIC over new ALDEN WEATHER MAPS



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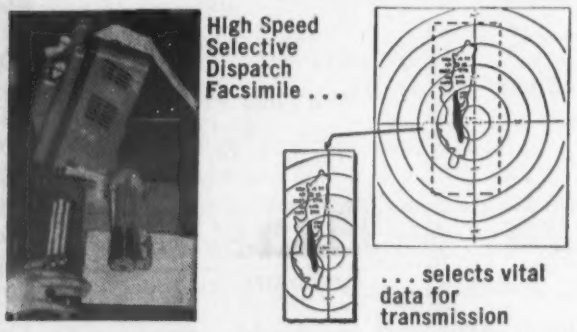
ALFAX SPEEDS VITAL RADAR INFORMATION to WARNING CENTERS



Flat Copy Scanner scans only vital portion of radar plot – speeds transmission.

Leaders feel it is almost unbelievable how Alfax in Alden Selective Dispatch Facsimile Systems anticipates nearly every requirement of practical convenience to get pertinent information where needed with a minimum of circuit time.

This system permits selection of pertinent data from any copy–letters, dispatches, and reports–for transmission at speeds up to 72 square inches (900 typewritten, 1800 newspaper type words) per minute. Ideal for sending vital bursts of information and commands–it can also send complete reproduction of any copy in strip form.

Worcester to Boston Test installation of simple, direct transmission of vital radar information.

Trial installations for U. S. Weather Bureau have provided operational radar data using induction coupling to telephone lines–private telephone lines – high speed transmissions over short haul lines.

Men concerned with the early severe storm warning have been tremendously intrigued with the results of trial installations for providing Alfax radar dispatches from remote radar station to Warning Centers. Alfax recordings of echo outlines, intensities with movement, heights and obvious weather interpretations annotated – provide 3 to 4 hours advance warning to such centers.

ALFAX RECORDINGS PIN POINT CEILING HEIGHTS

Alfax paper and Alden recorders demonstrate new high resolution in recording cloud heights from Rotating Beam Ceilometer signals.

NEW OCEANOGRAPHIC DATA UNVEILED by HIGH RESOLUTION ALFAX RECORDINGS

Alfax recording of suspended echo sounder resolves individual sea life in 25 foot echo return intervals.

Veteran underwater sound men at Woods Hole Oceanographic Institute use the wide tone shade response of Alfax Paper to *record up to 13 echo returns from one output pulse of the Echo Sounder.* Even when the transducer is placed where the noise ratio is higher than the echo return, they still catch the echo returns as distinct, legible recordings.

These versatile, high resolution echo sounder recording systems, designed by the Institute's technical staff around Alden 8" and 19" paper width Recorders, record in discreet steps from 6 to 1200 "flying spot" sweeps/min. by merely flipping a switch. They can record whole echo intervals up to 24,000 ft. depths to "look at" the bottom or magnify full scale some interval as small as 25 feet between the surface and the bottom with an accuracy of one part in 30,000.

ALFAX INTRIGUES TOP SCIENTISTS

Scientists working in the cardiograph field–brain waves–or like studies have been highly excited. They realized that the Alden recorders, plus shade gradations of Alfax Paper in proportion to output, particularly because of its response in the lighter shades or in responding to transient or weak signals, opened for them new horizons in graphic recording, and they are now able to study layers of strata of phenomena for which previously there had been no ready way of obtaining a record.

Scientists are now using or exploring Alfax Paper for new high resolution recording of:–

- **Magnetic, Ultrasonic, Atomic flaw detectors**
- **Infrared, sonar, loran**
- **Frequency spectrum monitoring**
- **Analogue computer outputs**
- **Normalized or sampled radar signals**

NOTE: *For specific information on Alden Recorder and Scanner Components or Facsimile equipment, call or write to Alden Electronic and Impulse Recording Equipment Co., Westboro 7, Mass.*

FOR AN EXCITING GLIMPSE OF THE NEW HORIZONS

being opened by Alfax Paper in facsimile communication and direct graphic recording, see us at Booth 68 and 69 at AFCEA Convention, Sheraton-Park Hotel, Washington, D.C., May 20-22.

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COLLINS in GROUND COMMUNICATION

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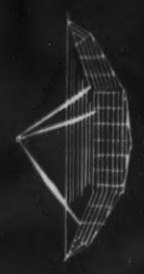
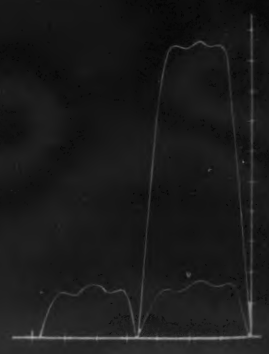


COLLINS in AMATEUR RADIO

In the early 1930's Collins set the standard in Amateur radio and, through continuous design and development, has raised this standard to its present single sideband station — the most honored and prized in the Amateur fraternity. This station is the top performing rig on the air with its kilowatt KWS-1 transmitter and highly selective 75A-4 receiver. Many of the leaders in the electronics industry became acquainted with Collins through the Company's superior Amateur equipment.



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CNI

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Navigation
Identification

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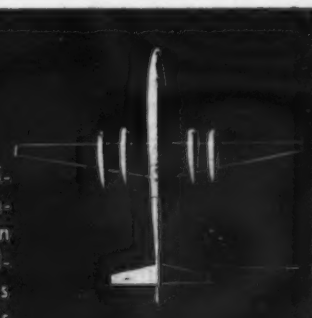
McDonnell Aircraft Corporation, first to use this design, has been instrumental in proving and refining the system.

COLLINS in AVIATION

Collins completely oufits airline, military and business aircraft with the most advanced communication, navigation, flight control and instrumentation systems in aviation. Many new lightweight, reduced-size versions are now being delivered. Collins designed the original Integrated Flight System, leads in combining comm/nav/ident units into a single compact "CNI" package for new military aircraft, and continues to pace the industry in developments in airborne radar, ADF, ILS, VOR, HF and VHF communication.



COLLINS in COMPONENTS AND TEST EQUIPMENT

The degree of precision and reliability of Collins products requires development by Collins engineering of components such as Autotunes and Autopositioners, Mechanical Filters, oscillators, heat reducing tube shields and ferrites. These developments and other high quality components are sold by a Collins subsidiary, Communication Accessories Company of Hickman Mills, Missouri. The same principles of accuracy and reliability apply to Collins test equipment, built especially for Collins but adaptable to testing other equipment types.

Visit the Collins Exhibit at the AFCEA Convention

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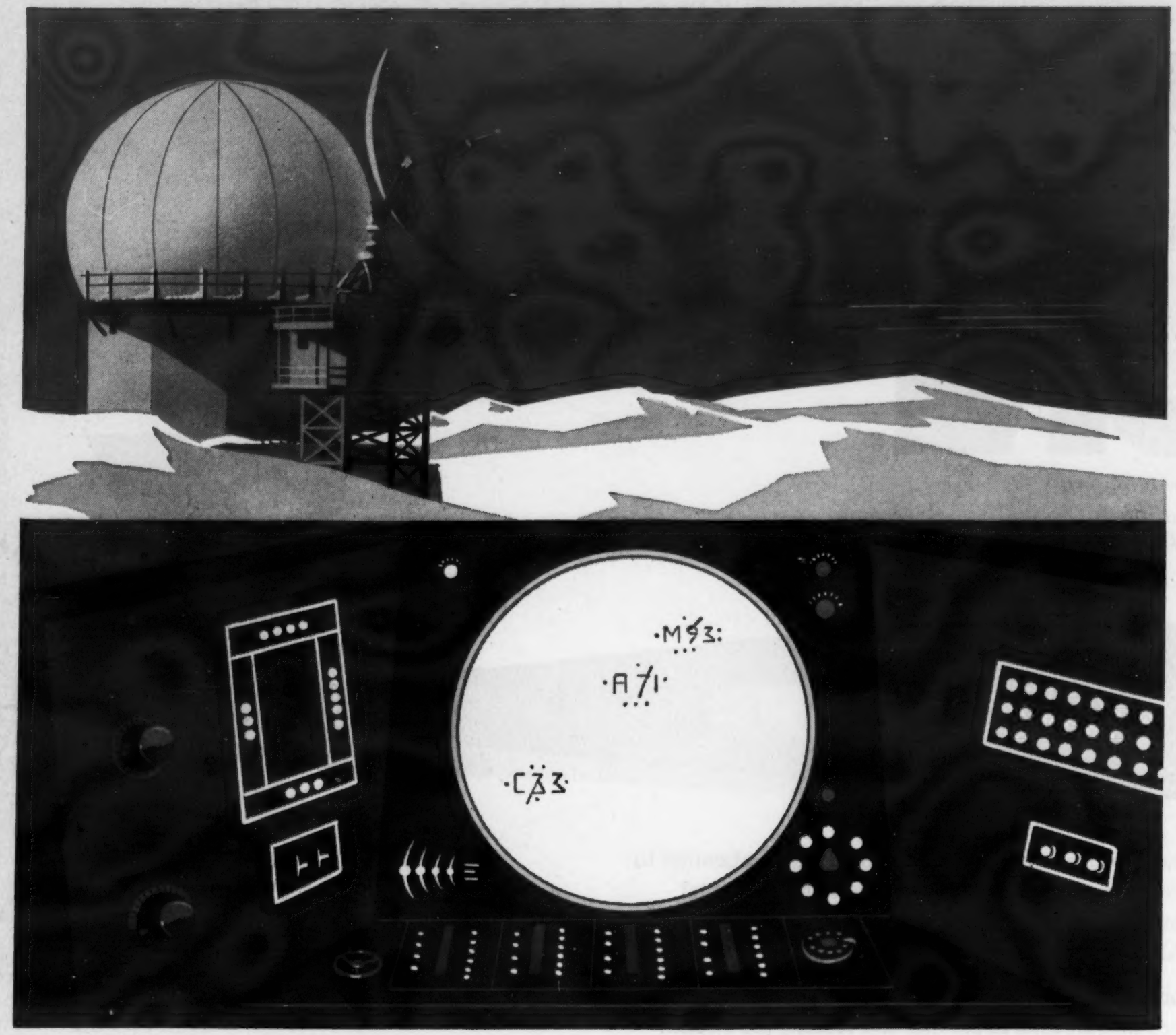

From radar antennas to "readout" equipment...

AMF has experience you can use

• Giant search antennas made by AMF form a vital part of the nation's air surveillance network • And converting the incoming radar signals into instantly understandable information are brain-like AMF Electronic Data Display Systems. The ultimate in "readout" equipment, these compact console units accept either analog or digital information, instantly convert, coordinate, and display the data on the face of a cathode-ray tube. Incoming signals can be interleaved with synthetic symbols for immediate reference, and any segment of the display can be offset and enlarged whenever desired. • See for yourself why, for radar control of air, ground, and harbors, or for general-purpose computer reading, AMF has the experience and equipment you can use.

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- *Radar Antennas*
- *Guided Missile Support Equipment*
- *Auxiliary Power Supplies*
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PRESIDENT PERCY G. BLACK, AFCEA

Colonel USA, (Ret.)
Assistant Vice President
Automatic Electric Company

A Convention Welcome

I wish to extend a hearty welcome to all members and guests of the Association who are present in Washington or with us in spirit on the occasion of the Eleventh Annual AFCEA Convention.

This Convention in the Nation's Capital opens a new era in AFCEA activities. Here, for the first time, our Exhibitors have an opportunity to display their exhibits to the rank and file of the Department of Defense. These exhibits will be an education to the many visitors who may never have an opportunity to view a communications and electronics display of such variety and magnitude outside of Washington.

Here in Washington, too, the leaders of our industry should be more than ever impressed with their responsibility in the national defense.

In addition to the audience from official Washington, selected engineering students from the universities in and around the Capital have been invited to view the industrial exhibits. This is in furtherance of the AFCEA policy to encourage scientific education throughout the United States, a policy so ably presented by our first President, General David Sarnoff, in an article in this issue.

Your Convention Committee has prepared a splendid program, which, for the first time, will include the presentation of selected technical papers.

The theme, "Marconi to Mars," is aptly descriptive of the scope of the Convention. The speakers, who will address the various meetings, are outstanding in the fields of communications and electronics. The setting for the Convention, Washington in May, is perfect, and I can assure those ladies attending an interesting and colorful program which only Washington can offer.

As my term of office as President of your Association draws to a close, I wish to thank one and all for your loyal support. The untimely death of our Executive Vice President laid a heavy burden on the National Headquarters staff. Thanks to their work and devotion, the Association has weathered a difficult period of readjustment and through their efforts has grown and prospered during the past year.

I would also like to add my deep appreciation to the Officers, Executive Committee, the Board of Directors and the Chapter Officers for their splendid support during my term of office.

★ ★ ★ ★ *a tribute from Defense*

Wilber M. Brucker
Secretary of the Army

On the occasion of the annual convention of the Armed Forces Communications and Electronics Association, I congratulate its members on the vital role their industrial-military chapters play in our Nation's preparedness. The Association enters upon its second decade of existence, distinguished by an impressive record of national service and achievement.

Your theme, "Marconi to Mars," characterizes the forward-looking concept of your Association, which is helping immeasurably to marshal American resources of skill and knowledge in order that the Army and its sister Services may continue to keep abreast of every advance of modern science and technology, and fully measure up to the challenge of the atomic age.

My best wishes for an inspiring convention and a new year of accomplishment which will be as fruitful for you and our Nation as have been those which are behind you.

Wilber M. Brucker.

★ ★ ★ ★

To the members of the Armed Forces Communications and Electronics Association, I extend greetings and welcome to the Nation's capital. The theme of your convention this year exemplifies progress—a half century of progress which can be matched by few other scientific fields in this fast moving age.

The Air Force is dependent upon the communications-electronics industry to a major degree, not only for the production of new and better devices and systems, but, in association with the military, for developing better methods and techniques to provide for a more effective Air Force combat potential. It is through such close association and the pooling of our experiences that better ways of doing things are evolved. We should do all we can to enhance this mutually profitable relationship in the interest of continued progress, which is so essential to the maintainance of security and world peace.

With best wishes for a successful 1957 convention and continued growth in the future.

James H. Douglas
Secretary of the Air Force

★ ★ ★ ★

Thomas S. Gates, Jr.
Secretary of the Navy

The theme of the 1957 AFCEA Convention, "Marconi to Mars," gives occasion for all of us to contemplate the remarkable advances in communications-electronics which have taken place in this Century in which we live. We are especially conscious of this in the Navy, where communications-electronics are so vital to our far flung operations over the vast ocean areas, with the constant necessity for close coordination of our surface, air and sub-surface forces.

Hence, from the days of the spark-gap to the present day of the controlled satellite, the Navy has maintained a continuous and increasing interest in communications-electronics. Last year the Naval Research Laboratory received the first radio waves from the planet Mars, thus opening new vistas for communications-electronics throughout the entire universe.

The AFCEA is to be congratulated on the selection of a convention theme which offers such a challenge to further progress in this field. I extend best wishes for a most successful and stimulating national convention.

Thomas S. Gates

UMI

EDITORIAL

M to M

TRULY, IT WAS A GREAT MOMENT IN the history of mankind and the history of Communications when, on March 27, 1899, Guglielmo Marconi, the father of radio, sent a received message from the vicinity of Boulogne, France, to the South Foreland, England, a distance of 32 miles. But today, only 58 years later, hundreds of received messages are sent thousands of miles daily, radar signals are being transmitted to the moon and back, and radio astronomers are picking up waves from stars millions of light years from Earth. Thus has Communications expanded and space dwindled since Marconi. And an entirely new science—a sister to Communications—has come into being, Electronics.

Against this backdrop of startling technical advance, members of the Armed Forces Communications and Electronics Association are now holding their eleventh annual convention at the Sheraton-Park Hotel in Washington. In accordance with their constitution, they are gathering to preserve and foster the spirit of fellowship among Communications, Electronics and Photography personnel of Industry and the Armed Forces; to promote efficiency in military Communications, Electronics and Photography; to further the general growth and development of these fields, and to encourage measures necessary to the national defense.

For the sake of defining mood and direction, a convention deserves a theme, and one has been chosen for the 1957 AFCEA show: To focus thought on both the past and the future of Communications and Electronics and to suggest the rushing, swift pace of progress in these fields, the phrase *Marconi to Mars* has been adopted. *Marconi to Mars!* — the words call to mind great things already accomplished and, at the same time, hint of even greater things yet to come.

Marconi to Mars! In recent years particularly, Communications and Electronics have made rich contributions to the welfare and advancement of mankind. Television, radar, electrophotography, facsimile transmission, microwave relays, high speed electronic computers, automatic navigation devices, electronic microscopes and telescopes—these are some of the miracle children already given to society by Communications and Electronics in the Twentieth Century.

And many another boon to civilization can be seen on the horizon, ready and waiting to come out of the future and benefit human life. Instantaneous, two-way communication between individuals anywhere in the world is even now far more than science-fiction. International television broadcasting—what could do more to break down the barrier of strangeness, create sympathy and understanding between nation and nation?—can safely be predicted. The electronic use of thermonuclear materials to produce heat and cold forecasts a completely new approach to heating and refrigeration. And two of Man's oldest and dearest dreams are also apparently about to come true: automation and space travel.

Already automation begins to usher in the Second Industrial Revolution and freedom of the human mind and spirit from the slavery of monotonous labor. The gifts of electronics, data handling machines and systems able to analyze marketing and sales data, schedule production, control manufacturing processes and timetable delivery of finished goods, will not only free human energy for more creative purposes and greater leisure, but they will also guarantee a speed and accuracy of work never before obtainable.

And space travel! *Marconi to Mars!* In this International Geophysical Year, with satellites soon to e launched, the exploration of space seems close at hand and is predicted by many within the next fifty years. What does space travel offer Man? New frontiers for settlement? Possibly, though most scientists think not. But, even if planets suitable for human habitation are never found, it is certain that science itself will be greatly enriched. The exploration of space will give scientists new frames of reference in which to test their hypotheses, their theories and their knowledge; the exploration of space will surely be the most fruitful project in scientific research ever undertaken.

But enough of bright pictures of a brilliant future for Communications, Electronics and the human race. There is much in the present and in the past to presage an entirely different sort of future—or even no future at all!

Much of the unparalled scientific advance this Century has seen does not bode good for civilization; indeed, much of it bodes only waste and destruction. Hydrogen and atom bombs, intercontinental guided ballistics and uranium casings—these are the weapons of mass devastation and ruin—weapons which misguided men of other nations, befuddled by fanatic ideologies, caught in the press and swirl of quickly changing world situations, might seek to use.

Marconi to Mars! In one last sense the theme of the convention particularly applies to its business. Both the military and civilian members of the Armed Forces Communications and Electronics Association have, as a chief purpose, the encouragement of measures necessary to the national defense. Surely all would agree that, if the weapons of modern war are ever launched against this country, there may be no future for Communications, Electronics, or the United States of America, unless we are fully prepared to counter with successful military action.

To the Romans, Mars was a symbol of military strength and preparedness. In our day, Mars remains a scientific symbol for electronic research and exploration. Times may have changed through the years but it still makes sense to hitch your wagon to a STAR.

ADM. ARTHUR W. RADFORD, USN
Chairman, Joint Chiefs of Staff

It gives me great pleasure to greet the members of the Armed Forces Communications and Electronics Association on the occasion of your Eleventh Annual Convention. We in the Armed Forces gladly acknowledge the significant contributions to our military effectiveness which have been made by the segment of American industry and science represented at your Convention.

Your Association, with its basic aim of improving cooperation between the Armed Forces and industry in communications, and of preserving the spirit of fellowship among the communications, electronics and photography personnel of industry and the Armed Forces, has provided an invaluable means of liaison among these groups. The vital importance of electronics to national defense makes it imperative that this relationship continue and be firmly cemented.

My congratulations and best wishes to each of you for a successful Convention. I regard your Association as a valuable component of our Defense Team. It is more important than ever that the Armed Forces and Industry remain partners in defense.

★ ★ ★ ★ Arthur Radford

GEORGE W. BAILEY
Toastmaster, AFCEA Convention

Mr. Bailey was born in Quincy, Massachusetts. He received an A.B. degree from Harvard College in 1907, and is Treasurer of his class.

During World War II, Mr. Bailey served in Washington, D. C., as Chief of the Office of Scientific Personnel under Dr. Vannevar Bush, Director of the Office of Scientific Research and Development, for which he was awarded the certificate of merit by President Truman. He was appointed Executive Secretary of the IRE in 1945.

He has long been well known as an amateur radio operator. From 1940 to 1952 he held the offices of President of the American Radio Relay League and President of the International Amateur Radio Union.

In 1950 he was appointed to the Engineering Sciences Advisory Committee by Major General Lewis B. Hershey, Director of the Selective Service System, and served until the Committee was disbanded in 1953.

Mr. Bailey served as President of AFCEA for two terms, having been elected initially by the Board of Directors on May 7, 1954. Presently, he is a Director of the Association and a member of its Executive Committee.

Possessing a pleasing personality and know how, he has been instrumental in furthering the progress of many organizations and has become known world-wide in the field of communications and electronics.

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REAR ADMIRAL JOSEPH R. REDMAN
Vice President, Western Union
AFCEA CONVENTION CHAIRMAN

★ ★ ★ ★

Affectionately known as "Joe" by his many friends, Admiral Redman is a Westerner by birth and cut his eye teeth in a "he man" gold mining town in California. Graduating with a BS degree from the U.S. Naval Academy and later completing studies in electrical engineering at the Post Graduate School, Annapolis, Maryland, and Columbia University, he received his Master of Science degree in 1921. In 1946, Admiral Redman was awarded an honorary Doctor of Law Degree from the University of Nevada—the institution he attended before entering the U.S. Naval Academy. With seventeen years of distinguished service at sea and fifteen years of service in positions of great responsibility ashore, Admiral Redman was a natural choice to become a Vice President of Western Union upon his retirement in 1946. He makes his permanent headquarters in Washington, D. C., to insure effective coordination of the telegraph company's domestic and international communications facilities with the heads of the military and other Government departments. His sense of humor, drive and enthusiasm are those characteristics which mark him as "that type of leader" we like to think about whenever we refer to civilian-military progress.

On the military side, in Admiral Redman, the Navy found a man in whom was combined sound naval training, long experience on surface and undersea craft, administrative ability, a scientific and technical background, and a flare for leadership. He was the second officer in the history of Naval Communications Service to hold the Directorship of Naval Communications for two tours of duty.

Through his exercise of foresight, energy, knowledge and wisdom, the world-wide expansion and modernization of the Navy's communications system was accomplished during World War II. For this he received one of our Nation's meritorious awards, the Distinguished Service Medal. Under his direction, certain methods, which had a vital part in the successful prosecution of the war, were developed. They may not be disclosed but are known to a past President of the U.S. and a Secretary of the Navy.

He served in the Southwest Pacific Forces on patrol in the Coral Sea as Commander of the Cruiser *USS Phoenix* from October 1942 to April 1943. Among his many other decorations is an award made by the King of England, as Commander of the Military Division of the Order of the British Empire. Admiral Redman was the Navy Representative during the war on the Joint Communications Board, the Combined Communications Board, the Board of War Communications, and the State Department's Telecommunications Committee. Having been selected three times by the State Department to represent the U.S. at international communications conferences (known as CCIR), he served with distinction at Copenhagen, Madrid and Cairo. He is an honorary member of the Veteran Wireless Operators Association and a past national President of AFCEA.

The Armed Forces Communications and Electronics Association wishes to express its appreciation and thanks to Admiral Redman and his staff for the efficient organization of this year's convention. As Convention Chairman, he has scored again.

AFCEA NATIONAL CONVENTION PROGRAM

May 20, 21, 22, 1957.
Monday, Tuesday, Wednesday.

- 103 Exhibitors
- 150 Exhibit Units
- Daily Technical Sessions

Washington, D. C.
Sheraton-Park Hotel

- Trip to Naval Research Labs
- 6 Important Social Events
- Special Program for Ladies

EVENTS

Monday, May 20th

8:30 AM—Sheraton Hall
Opening Breakfast
9:30 AM— **Official Opening of Exhibits**
10:00 AM—Caribar Room
Chapter Presidents Conference
10:00 AM-12:00—Continental Room
Engineering Papers on Research and Application
12:30 PM—Sheraton Hall—**Keynote Luncheon, RAdm. R. Bennett**
2:00 PM-5:00 PM—Adams Hamilton Room
Industrial Movies
2:30 PM-4:30 PM—Sheraton Hall
Panel on Scatter Propagation, Moderator; RAdm. J. Wenger
7:00 PM—Continental Room
Reception
8:00 PM—Sheraton Hall
Buffet Supper

Exhibits: 9:30 AM—9:00 PM

Tuesday, May 21st

9:00 AM—Caribar Room
Council & Directors Meeting
10:00 AM-12:00—Continental Room
Engineering Papers on Research and Application
12:00 AM—Busses to Naval Research Laboratory
Embark at hotel, clearance at NRL, lunch, tour, return at 3:30 PM
2:00 PM-5:00 PM—Adams Hamilton Room
Industrial Movies
7:00 PM—Continental Room
Reception
8:00 PM—Sheraton Hall—**Banquet**
Speaker: **Donald C. Power,** President, General Tel. Corp.

Exhibits: 9:00 AM—9:00 PM

Wednesday, May 22nd

8:00 AM—Caribar Room
Officers & Directors Breakfast
10:00 AM-12:00—Continental Room
Engineering Papers on Research and Application
12:30 PM—Sheraton Hall
Industrial Luncheon
Speakers: **The Hon. Frank D. Newbury,** Asst. Sec'y. Def., Research & Engineering, and **Mr. James M. Bridges,** Director of Electronics, Office of Asst. Sec'y. Def., R. & E.
Question and Answer Period
2:00 PM-5:00 PM—Adams Hamilton Room
Industrial Movies

Exhibits: 9:00 AM—5:00 PM

FOR THE LADIES

Monday, May 20th

9:30 A.M.—Assemble in the Madison Room for a Continental breakfast, "get acquainted hour," and review of plans.
11:30 A.M.—Assemble in the Madison Room
12:00 Noon—Buses leave for Fort McNair—Quarters 11
12:30 P.M.—Mrs. James D. O'Connell will greet the ladies at her home.
1:30 P.M.—Luncheon—Fort McNair Club
There will be a nominal charge of $2.00 to help defray expenses.
7:00 P.M.—RECEPTION AND BUFFET SUPPER, Sheraton-Park Hotel.

Mrs. Frances C. Engel

Tuesday, May 21st

9:45 A.M.—Assemble in the Madison Room
10:15 A.M.—Private cars leave for Georgetown and Embassy Tour (If you are the scientific type, an interesting tour of the Naval Research Laboratory is scheduled at 11:30—Transportation and lunch—$2.75)
1:45 P.M.—Assemble in the Madison Room
2:15 P.M.—Buses leave for Capitol Tour
7:00 P.M.—RECEPTION AND BANQUET

Wednesday, May 22nd

9:45 A.M.—Assemble in the Madison Room
10:15 A.M.—Buses leave for National Gallery of Art

Committee: Mesdames Engel (Chairman), Black, Clark, Finlay, Finley, Jacocks, O'Connell, Redman, Saddler, Wenger.

Technical Papers:

Monday, May 20, 1957

10:00-10:30 "Rapid Fault Elimination in Complex Electronic Systems" by J. F. Scully, Monroe Calculating Machine Co.
SYNOPSIS: Rapid elimination of faults in complex electronic systems is mandatory if full operational use is to be made of their inherent capabilities. An automatic diagnosis system employing dual equipments for detection and location of defective components has been in field use for some time. Extension of the system is being made to non-dual circuits. In addition, the new system employs automatic marginal checking during operation without loss of operational time.

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10:30-11:00 "Single Sideband Receivers" by H. F. Comfort, Radio Corporation of America
SYNOPSIS: A single sideband receiver equipment with pulse locked generator frequency control system is described. This equipment was developed with frequency control that will meet performance requirements for multiple-tone operation, voice and twin sideband. The advantages and disadvantages of single sideband versus double sideband are discussed as well as the stability requirements.

11:00-11:30 "Single Sideband for Air-Ground Communications" by E. W. Pappenfus, Collins Radio Co.
SYNOPSIS: A discussion of the present-day requirements for air-ground communications with a listing of limitations of airborne high frequency equipment. The advantages to be offered by single sideband emission will be given and special operating features of airborne single sideband transmitters and receivers will be stressed. The paper will conclude with a brief description and specifications of an airborne single sideband transceiver now in development.

11:30-12:00 "A Single Sideband Radio Central to Replace Military Wire Lines" by A. M. Creighton, Motorola, Inc.
SYNOPSIS: A description of a practical system and equipment for communication between mobile stations that would function in a manner similar to the telephone. Duplex type speech transmission is achieved and also selective calling of the different subscribers. The system is a multiplexed communications system supplying full duplex telephone type service to mobile subscribers. Employed in the system are single sideband techniques, and it operates in the 150 mc range. Spectrum efficiency is achieved by channel spacing of only 6 kc.

Tuesday, May 21, 1957

10:00-10:30 "The Trend of Facsimile in Military Communications" by A. G. Cooley, Times Facsimile Corporation
SYNOPSIS: The trend of facsimile in military communications began in 1923 with ship-to-shore transmissions and plane-to-ground transmissions in 1930. At present its greatest application is in meteorological services. Other uses include: message communications and transmission of X-ray films. The successful transmission of a newspaper to San Francisco over a video channel has encouraged communicators to look toward high speed facsimile as the answer to trunk line communications. Facsimile's commercial success points to widespread adaptation in military systems.

10:30-11:00 "Processing, Narrow-Band Transmission, and Remote Display of Radar Data" by S. P. Detwiler, Lewyt Manufacturing Corporation
SYNOPSIS: The processing and narrow-band transmission of gap-filler-radar data for use in the SAGE system is discussed with a minimum of theoretical detail. The performance of these functions by Coordinate Data Transmitter AN/FST-1 is described, with particular attention being paid to the digital integration techniques employed. The possible application of these techniques to other radar display problems is discussed. A short description of the Coordinate Data Monitor OA-947 remote indicator and its operation is also included.

11:00-11:30 "Multiplexing Circuits in the National Air Defense Communications Networks" by J. B. Naugle, Lenkurt Electric Co.
SYNOPSIS: An acute problem in developing a communications network for the continental air defense system is the linking of remote outposts with computing and command centers and with each other. Point to point and forward scatter microwave systems multiplexed with single sideband carrier have proven one of the most practical methods. This carrier equipment is similar to that used by commercial telephone companies and permits the maximum number of channels to be transmitted over a microwave system. The availability of proven commercial carrier equipment as an interim measure has been of great value to air defense communications.

11:30-12:00 "The Air Route Surveillance Radar for U.S.A. Air Traffic Control" by B. I. McCaffrey, Raytheon Manufacturing Co.
SYNOPSIS: The increase in speed of aircraft and in the amount of air traffic during the last decade is going to make Grand Canyon crashes all too common if we do not soon have a major overhaul of our air traffic control system. The decision to undertake the overhaul has been evidenced by the procurement program sponsored by the Civil Aeronautics Administration, designed to provide complete nationwide radar coverage by means of long range surveillance radar equipment. Some of the important characteristics of a long range surveillance system for air traffic control are range performance, resolution in range and in azimuth, ability to separate moving from fixed targets and discrimination against clutter and reliability of operation. Performance is to be achieved in the CAA radar by many proven techniques as well as a few recently developed devices. Circular Polarization, cascade cancellation for Moving Target Indication, high angle cosecant squared antenna coverage, low noise figure and L-band components are some of the means used by experienced design engineers to meet the tough requirements specified by the CAA. This will result in the installation within the U.S.A. of excellent Air Route Surveillance facilities leading to improved air traffic safety coast to coast.

Wednesday, May 22, 1957

10:00-10:30 "The Vanguard Launching Vehicle Instrumentation System" by V. J. Crouse, The Glenn L. Martin Co.
SYNOPSIS: Instrumentation plays a vital role in the flight test program which will precede the launching of the first earth satellite. Precision measurements must be made in the presence of liquids and gases corrosive enough to etch most types of steel and at temperatures ranging from more than 900 degrees Fahrenheit to 300 below zero. Each test vehicle will carry an instrumentation system capable of making between 150 and 200 different measurements of such items as pressures, voltages and currents, temperatures, strains and acceleration.

10:30-11:00 "Results of a Simple Technique for Handling Complex Microwave Circuits" by Alexander Horvath, Sylvania Electronic Defense Laboratory
SYNOPSIS: A brief description of a technique to obtain the design parameters for complex circuits consisting of short lengths of transmission line. Several examples are presented of the application of the technique to common problems. Results show the superior performance that has been obtained with a variety of components in the .5 to 10.0 kmc range. The components include filters, couplers, and a 90° differential phase shifter.

11:00-11:30 "A Fully Automatic Teletypewriter Distribution System" by Leith Johnston, Automatic Electric Co.
SYNOPSIS: A description of a fully automatic teletypewriter distribution system which delivers a message to a plurality of local and remote stations as directed by three character delivery distribution indicators included in the heading of the message. Each delivery distribution indicator can direct the message to as many as ten stations. While the system was designed to meet military specifications, the switching principles used are applicable to commercial teletypewriter traffic also.

11:30-12:00 "Some Aspects of Telegraphic Data Preparation and Transmission" by W. B. Blanton, Western Union Telegraph Co.
SYNOPSIS: A brief explanation of the use of telegraphic principles and equipments in the original preparation and transmission of data, and in directing, switching, and sorting data at telegraph or computer centers. Inasmuch as most present-day telegraph networks operate with 5-level punched paper tape, particular emphasis will be given to describing a 5-level transmission system arranged for detecting transmission and equipment errors, and automatically assuring a correct received copy. A model of this equipment will be displayed.

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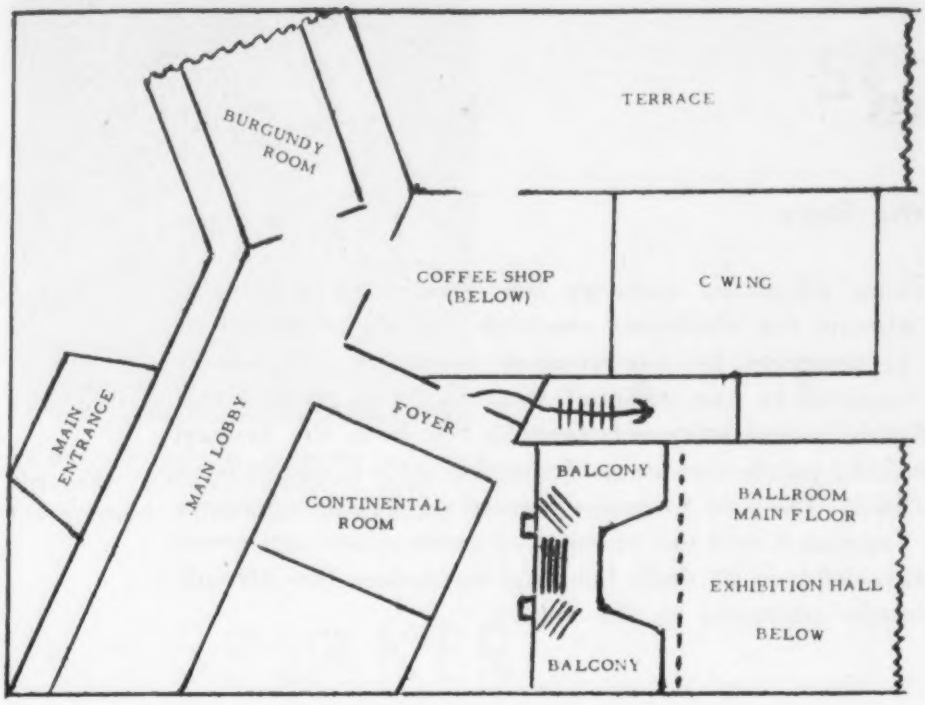
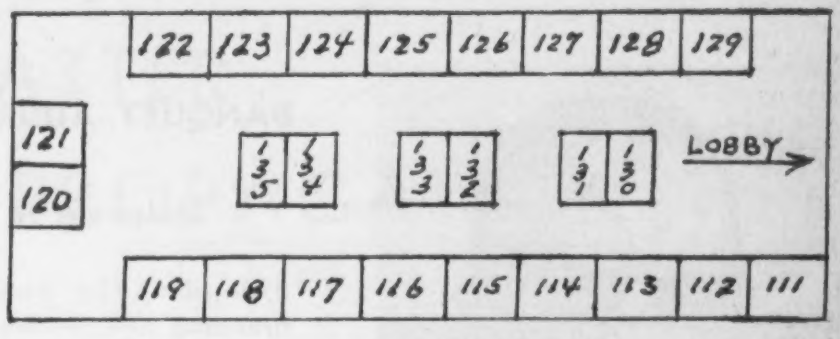
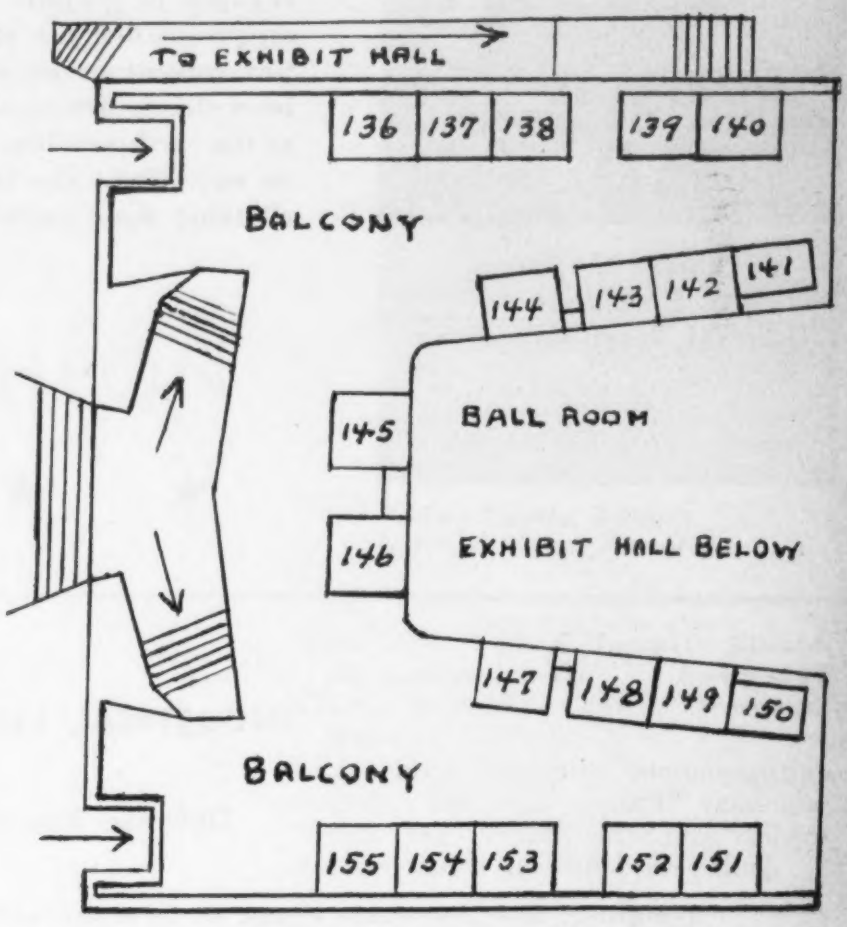


Technical sessions and forums will be held in the Ballroom or Continental Room. Exhibits will be held in the Burgundy Room; Balcony of Ballroom; and Exhibit Room below the Ballroom.



Burgundy Room



Balcony of Ballroom →

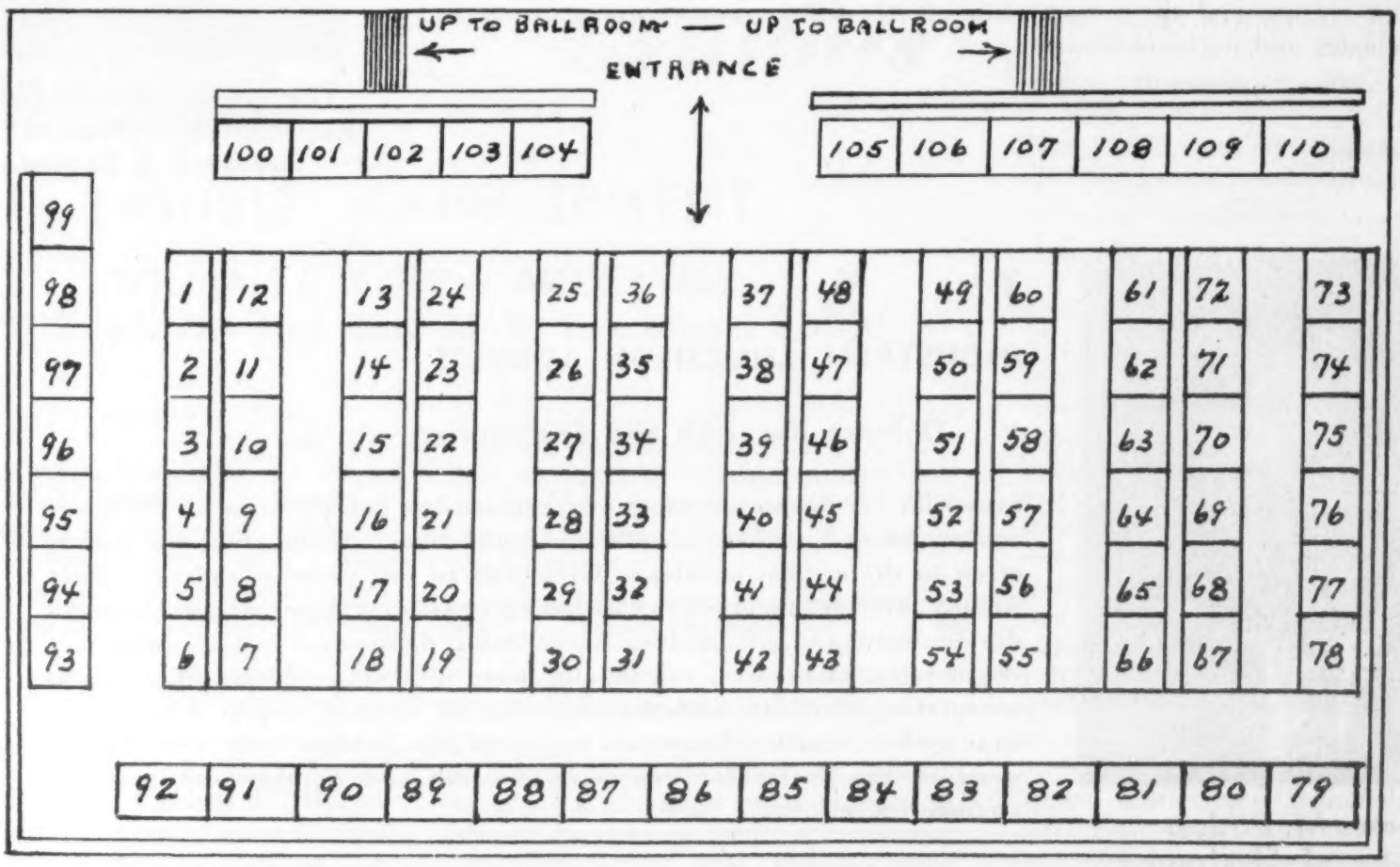


Exhibit Room below the Ballroom

Convention Speakers

★ ★ ★ ★

Donald C. Power
President
General Telephone Corp.

BANQUET ADDRESS

Stairways to the Stars

Synopsis: The American telephone industry has long been a natural breeding and testing ground for electronic research and development of greatest importance to progress by Government scientists and others engaged in projects required in our national interest. The mutual and reciprocal benefits of this co-operative relationship for both the federal Government service and the public service performed by this industry have been clearly demonstrated. The new horizons opened up by such projects as the earth satellite, Vanguard, and the probing of outer space will prove no exception. The brainchildren of daily business operations are already climbing their earth-made stairways to the stars.

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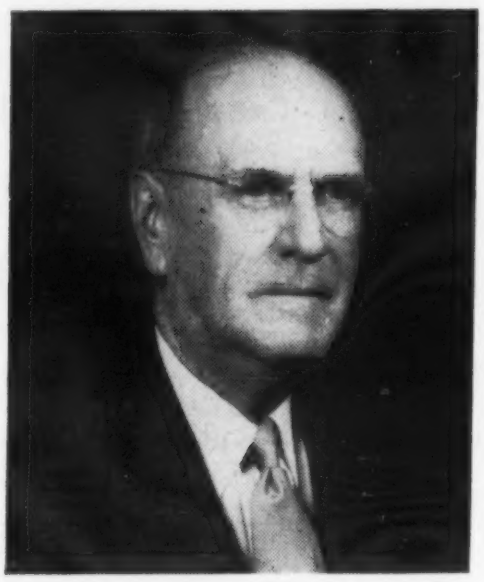
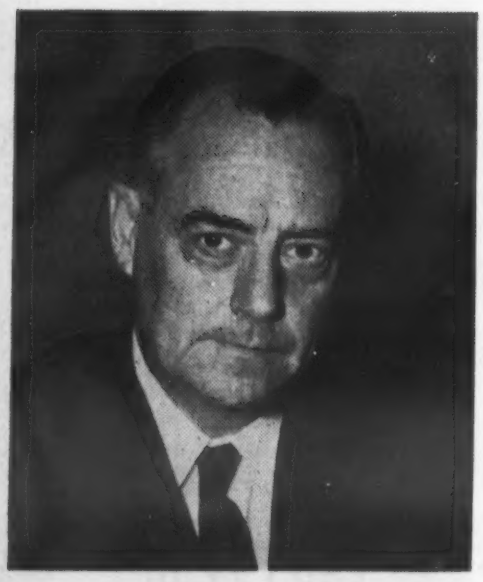
INDUSTRIAL LUNCHEON ADDRESS

Defense Research and Engineering

Synopsis: The Honorable Frank D. Newbury will explain the operations of the office of The Assistant Secretary of Defense for Research and Engineering and the relationship of this office and its organization to industry and national security.



The Hon. Frank D. Newbury
Assistant Secretary of Defense
Research & Engineering



James M. Bridges
Director of Electronics
Office of Asst. Sec. of Defense

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INDUSTRIAL LUNCHEON ADDRESS

Defense Research and Engineering

Synopsis: A discussion of the ever-increasing complexities of electronic equipment and systems in military applications. Major emphasis will be given to the critical problems developing in our national defense effort. Among these are included sky rocketing costs for weapon system electronic development and production, unrealizable demands upon scientific and engineering manpower, continually more difficult problems of attaining acceptable reliability, and the extension of weapon system development time cycles. Another important aspect of Mr. Bridges' talk will relate to some of the causes for expensive research and development costs for engineering efforts.

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RAdm. Joseph N. Wenger
Director, Communications and Electronics, Joint Chiefs of Staff

SYMPOSIUM MODERATOR ON

SCATTER PROPAGATION

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SPEAKER KEYNOTE LUNCHEON

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RAdm. Rawson Bennett
Chief of Naval Research

Index to Exhibits

EXHIBIT MANAGEMENT

WILLIAM C. COPP & ASSOCIATES
1475 Broadway • New York 36, N. Y. • BRyant 9-7550

Ace Electronics Associates, Inc. ***Booth #30***
99 Dover Street, Somerville 44, Mass.
Acepot, sub-miniature ½" precision wire wound potentiometer, Acepot, nonlinear potentiometer 1" to 3"; Ace-trim, sub-miniature precision wire wound potentiometer trimmer; Aceohm, sub-miniature precision wire wound potentiometer trimmer; Ace-relay, sub-miniature relay.

Admiral Corp. ***Booths #79, 80***
3800 Cortland St., Chicago 47, Ill.
Two of Admiral Corporation's contributions to the Communications of the Armed Forces are featured in the exhibit: The light weight 1750 channel communications receiver AN/ARC-55 and its amazing subminiaturized control box. Selection of any of the 1750 channels from a remote position is demonstrated.

► **See ad on page 129** ◄

The Airpax Products Co. ***Booth #137***
Middle River, Baltimore 20, Md.
High vibration chopper, demonstration of Ferrac magnetic amplifier, demonstration of miniature magnetic circuit breaker, magmeter frequency detector for telemetering, and Pulsite pulse transformers.

Alden Electronic & Impulse Recording Equipment Co. ***Booth #68***
Alden Research Center, Westboro, Mass.
High speed facsimile communication systems, flat copy optical scanning, "Quick See" visible recording ceilometer, weather, and radar recording.

► **See ad on page 4** ◄

Alfax Paper & Engineering Co. ***Booth #69***
Alden Research Center, Westboro, Mass.
New 1,000 inch/sec. instantly visual electrosensitive recording paper.

American Instrument Co., Inc. ***Booth #19***
8030 Ga. Ave., Silver Spring, Md.
Aminco Climate-Lab for testing electronic components under MIL and JAN specifications; Aminco-Aire for separate chamber humidity conditioning; Humidity sensing elements and Hygrometer control systems, NEW ice, snow, sleet detector for outside installation.

American Machine & Foundry Co. ***Booths #148, 149***
Defense Products Group
1101 N. Royal St., Alexandria, Va.
AMF "Digitron"—a dynamic display of selected symbols on a cathode-ray tube. Power Transient Analyzer. Frequency Meter. Potter and Brumfield Relays. AMF Silver-Zinc Batteries.

► **See ad on page 8** ◄

EXHIBITS—continued

American Telephone & Telegraph Co. ***Booths #88, 89, 90, 91, 92***
32 Ave. of the Americas, N. Y. 13, N. Y.
Bell System looks ahead for defense. New magnetic core amplifier and new UHF radio service with off-site supervisory control. Communications networks are ready in case of enemy attack. Bell System effort is helping to make the DEW line a reality.

► See ad on page 1 ◄

A.R.F. Products, Inc. ***Booth #1***
7627 Lake St., River Forest, Ill.
Exhibit displays equipment from A.R.F. Products, Inc., Research and Manufacturing Facilities: AR-1A Deviation Meter; AN/UPM-15 Pulse Generator; Pulse Type Transmitter and Receiver for Remote Control; URM-48 FM Signal Generator; ARN-18 Glide Slope Receiver; Dummy Load for Testing Radar; Fabricated Components such as Transit Cases, Dust Covers, Chassis, etc.

The Arnold Engineering Co. ***Booth #129***
P. O. Box G, Marengo, Ill.
Exhibit highlights magnetic materials which include Alnico permanent magnets, cast and sintered; Silectron "C," "E," and "O" cores; tape wound cores of high permeability alloys, including Deltamax, Supermalloy and 4-79 Mo-Permalloy; bobbin cores for computer applications; Molybdenum Permalloy powder cores; iron powder cores; Vicalloy, Cunife, Supermendur and other special magnetic materials.

► See ad on page 133 ◄

Automatic Electric Sales Corp. ***Booth #61***
1033 W. Van Buren St., Chicago 7, Ill.
Automatic Electric, whose relays and stepping switches form the "brains" of the Signal Corps' AN:FGC-30 central office teletypewriter switching center, introduces its class "E" relay that reduces the best of the class "B" relay features to a minimum on space and weight.

► See ad on page 5 ◄

Automatic Telephone & Electric Co., Ltd. ***Booth #21***
Strowger Works, Liverpool 7, England
Telegraph distortion measuring sets; Electronic regenerative repeaters; Narrow-band frequency-shift and pilot-carrier telegraph systems as used by Airways and Air Communication Service of USAF on "STRATCOM" system. All equipment being demonstrated.

Autonetics, A Division of North American Aviation, Inc. ***Booths #29, 30***
9150 E. Imperial Highway, Bellflower, Calif.
Exhibit will feature Autonetics "Jewels of Industry" as applied to automatic navigation, armament control and flight control systems, analog and digital computers, automatic machine tool controls, airborne instrumentation and special products.

Behlman Engineering Co. ***Booth #146***
114 So. Hollywood Way, Burbank, Calif.
The Behlman invertron is an electronic AC power source. It features exceptional stability, accuracy and versatility. It can be obtained in a wide variety of models to cover any desired frequency range, either fixed or variable, and any desired power output. The invertron is completely electronic; there is no rotating equipment involved.

Bell Aircraft Corp., Avionics Division ***Booths #97, 98***
P. O. Box 1, Buffalo 5, N. Y.
Bell Aircraft's exhibit presents news-making achievements in the field of avionics. The automatic carrier landing system, inertial instrumentation system, radar-guidance and control components, servo valves, precision accelerometers, integrators and transistorized temperature control amplifiers represent only a few of the systems and equipments which are highlighted.

► See ad on page 147 ◄

Bell & Gossett Co. ***Booth #118***
(See listing page 24)

Bendix Aviation Corp., Pacific Div. ***Booth #45***
North Hollywood, Calif.
Decca Navigation System for helicopters makes navigation as simple as following a road map in any weather.

Bendix Aviation Corp., Bendix Radio Division ***Booth #44***
Baltimore, Maryland

Bird Electronic Corp. ***Booth #128***
1800 E. 38th St., Cleveland 14, Ohio
Products Exhibited: Power measuring equipment for UHF-VHF frequencies; Termaline & Thruline R. F. Wattmeters; Termaline RF Resistors; Coaxial Switches; Coaxial RF Filters.

Bodnar Industries, Railway Electronics, Inc. ***Booth #83***
238 Huguenot St., New Rochelle, N. Y.
New Amendments to Government Specs make it increasingly important to see and hear about the latest developments: Bodnar Panels and Dials in accordance with MIL-P7788 'Special Coating' approved process, Integral lighting of instruments and meters as outlined in Air Force Exhibit WCLSI-2-204, 'Railway Electronics' Portable Telegraph, Bias and Distortion Meter designed by Western Union.

Boston Insulated Wire & Cable Co. ***Booth #114***
65 Bay St., Boston 25, Mass.
Insulated wires and cables specifically designed for military applications.

Burgoyne Testing Laboratories, Inc. ***Booth #138***
542 Main St., Westbury, N. Y.
Military Equipment Manufacturers, including: Environmental — High — Low Temperature — Altitude — Humidity — Salt Spray—Sand and Dust—Sunshine —Rain—Immersion—Fungus—Explosion Proof—Shock—Vibration—Acceleration, etc. *Mettalurgy*—Photomicrographs—Metalographs—Experimental Heat Treating—Micro Hardness—Tensile, etc. *Chemical*—Qualitative—Quantitative analyses of metals and materials. *Quality Control*—X-Ray—Magnaflux, Zyglo, etc. Other facilities for testing.

Burroughs Corp., Defense Sales Div. ***Booths #55, 56, 57***
6071 2nd Ave., Detroit 32, Mich.
Demonstration of new techniques in lenticular optics; BCT 301 core tester; magnetic core memory plane and other core devices; transfer storage counter; magnetron beam switching tubes; miniature and jumbo Nixie indicator tubes; printed circuit cards and other electronic components from SAGE computer; electronic and electro-mechanical communications gear.

► See ad on page 111 ◄

Capitol Radio Engineering Institute ***Booth #12***
3224 16th St., N.W., Washington, D. C.
CREI residence and home study programs in electronic engineering technology and management.

► See ad on page 56 ◄

CGS Laboratories, Inc. ***Booth #63***
391 Ludlow St., Stamford, Conn.
Multicoupler for 2-32 mc, CU-483 with our FDA (Frequency Distributed Amplifier). Live demonstration of TRAK Code Converter producing page copy automatically from Morse Code off the air. TRAK Static Rejector with circuitry newly arranged on hinged vertical panels. TRAK Panoramic Receiver with no moving parts for 100-150 mc, Model PAN-1C tuned with INCREDUCTOR saturable reactors. Registration in ECM organization, Association of Old Crows.

► See ad on page 134 ◄

Collins Radio Co. ***Booths #94, 95***
Cedar Rapids, Iowa
Exhibit stresses Collins' participation in single sideband, scatter and microwave systems, typical items of Collins airborne and ground communications equipment developed for the military services.

► See ad on pages 6, 7 ◄

The Combined Book Exhibit, Inc. ***Booth #126***
950 University Ave., N. Y. 52, N. Y.
A subject display of recent technical books of many publishers will be shown.

Connecticut Telephone & Electric Corp. ***Booth #62***
70 Britannia St., Meriden, Conn.
Telephone communication equipment, carrier equipment. UHF-VHF radio. miscellaneous electro-mechanical and

electronic equipments and components (unclassified) manufactured for the Navy, Air Force, and Signal Corps.

Copperweld Steel Co. ***Booth #22***
Glassport, Penna.
Exhibit features Copperweld products made by the unique molten-welding process, in which a heavy copper covering is inseparably welded to an alloy steel core. These products are: line wire, guy and messenger strand, antenna wire, ground pads and clamps, anclior pads, insulator ties and fine wire.

Craig Systems, Inc. ***Booths #64, 65***
Danvers, Massachusetts
HELICOP-HUT Radio Relay Station and HELICOP-HUT Radio Navigation Station. Two self-contained, lightweight, highly mobile communications systems that can be packed up and transported by helicopter to remote locations and put into operation within minutes. Extra mobility features include device for truck load and dolly for towing HELICOP-HUT over land.

Dage Television Div., Thompson Products, Inc. ***Booth #67***
W. 10th St., Michigan City, Ind.
Dage Television Division will exhibit newest military weather vision console, model 785-W-2 complete with basic weather vision system accessories. Dage weather Division equipment now installed at Grandview AFB, Missouri; McGuire AFB, New Jersey. Weather Vision, newest means of providing complete weather briefing and information from one central point on a base to many remote receiving locations saving personnel, time, money and effort.

Daystrom, Inc. ***Booths #41, 42***
430 Mountain Ave., Murray Hill, N. J.
Newest equipment from all Daystrom divisions for use in aircraft communications and navigation control, electronic and electrical instruments for general military use and other specialized electronic systems for defense use. See Daystrom for quality leadership and dependability in instrumentation.

► See ad on pages 36, 37 ◄

Dictaphone Corp. ***Booth #11***
430 Lexington Ave., N. Y. 17, N. Y.
New dictaphone dictet portable tape recorder—under three pounds, battery-powered, transistorized amplifier. New dictaphone multi-channel continuous recording equipment dictatape, dictacord, dictalog.

Douglas Microwave Co., Inc. ***Booth #54***
252 E. 3rd St., Mt. Vernon, N. Y.
Complete line of microwave and radar test equipment and components including our new coaxial continuously variable attenuators and broad band high directivity directional couplers.

► See ad on page 146 ◄

Du Mont Laboratories, Inc., Allen B. ***Booth #99***
750 Bloomfield Ave., Clifton, N. J.
A variety of special tubes including cathode-ray tubes, multi-gun tubes, multiplier phototubes, image converters, display cathode-ray tubes, airborne and shipborne radar; bright display equipment for airport use; military television equipment; mobile communications equipment; oscilloscopes and air traffic control scopes; special transformers and transistorized electronic units.

Eldico Electronics Corp. ***Booth #47***
72 E. 2nd St., Mineola, N. Y.
SSB-100 MIL—SSB, 100 watt P.E.P. designed for simplex telephone or telegraph operation. Frequency coverage 2.2—30 mcs.—crystal controlled stable filter type exciter—50 db or greater attenuation of unwanted sideband and carrier—SSB-100 MIL—Linear Amplifier 650 watts P.E.P. output—frequency range 2.2—30 mcs.—30 watts P.E.P. drive requirement—self-contained including power supply. (Both products are new equipment).

Electro Impulse Laboratory, Inc. ***Booth #10***
208 River St., Red Bank, N. J.
Power meters, calorimeters, direct-reading calorimeter bridge.

Electronic News ***Booth #141***
7 E. 12th St., N. Y. 3, N. Y.
Electronic News—the industry's weekly newspaper—with copies of the latest issue available at the booth. Late news bulletins posted in booth as gathered by Fairchild News Service, the largest business news gathering organization in the world.

Export Packing & Crating Co., Inc. ***Booth #153***
5401 1st Ave., Brooklyn 20, N. Y.
Illustrations of modern methods of military packaging and packing. Displays of our box and crate section, our carton factory and processing methods. Illustration of a huge radar screen and a tiny resistor packed for export, showing range of our flexibility exhibits of waterproofing and dehydration packs, heat sealing barriers, materials handling methods.

Fairchild Camera and Instrument Corp. ***Booths #31, 32***
Robbins Lane, Syosset, L. I., N. Y.
Radar moving target simulator system; Automatic voice data link; Weight deviation recorder (fractional gram range); High speed Motion Analysis Cameras; Aerial Reconnaissance Systems featuring IR, Radar and Photo.

Federal Telecommunication Labs., A Div. of International Telephone & Telegraph Corp. ***Booth #37***
500 Washington Ave., Nutley 10, N. Y.
Model display of another microwave "First" by Federal Telecommunications Lab.: over-the-horizon broad-band microwave radio and the recently declassified TACAN automatic recording and data link for air traffic control.

Federal Telephone & Radio Corp., a Div. of International Telephone & Telegraph Corp. ***Booth #38***
100 Kingsland Rd., Clifton, N. J.
Radio communication equipment, TACAN and other radio aids to aerial navigation test sets, airborne power supplies.

► See ad on pages 118, 119 ◄

Ford Instrument Co., a Division of Sperry Rand Corp. ***Booths #100, 101***
31 - 10 Thomson Ave., L. I. City 1, N. Y.
Computers and controls for government and industry, including airborne and vehicular navigational systems, missile controls, gunfire control computors and a variety of other systems—as well as a line of computer and servo components.

► See ad on page 141 ◄

General Bronze Corp. ***Booth #127***
711 Stewart Ave., Garden City, N. Y.
The General Bronze Corporation is foremost in the design, development and precision manufacture of UHF waveguide systems, waveguide test components, complete radar, scatter communications and radio telescope antennas and systems, including pedestals and pedestal drive mechanisms as well as proprietary designs for antenna feed systems and high-power rotary joints.

General Electric Co., Heavy Military Electronic Equipment Dept. ***Booths #84, 85, 86, 87***
Syracuse, N. Y.
Military electronic systems and their applications in the "Systems Age"—detection and location, tracking, data handling, missile guidance and control and ground control of interceptors—developed and produced by a closely integrated team of engineers, scientists and technicians with the support of the complete research and production facilities of the Company.

► See ad on page 33 ◄

General Electric Co., Light Military Electronic Equipment Dept. ***Booths #25, 26***
French Rd., Utica, N. Y.
Military Aviation Electronic Systems—Communication and Navigation (including synchronous communications, data link and doppler navigation), Electronic Warfare (countermeasures and special electronic techniques), Weapon Control (radars, missile guidance, fuzes and automation systems) and Airborne Detection (ASW, AEW and search radars). Features new circuitry display for the synchronous detection adaptor which has aroused significant interest in Airborne communication areas.

► See ad on page 44 ◄

EXHIBITS—continued

General Electric Co., Missiles & Ordnance Systems Dept.
Booths #27,28
3198 Chestnut St., Philadelphia, Pa.
1) Display will consist of Army, Navy and Air Force missile models and how the Missile and Ordnance Systems Department of General Electric is helping to develop missiles. 2) News item of interest will be a description of a new, multi-million dollar data processing center for use by Ground Instrumentation operations.

General Electric Co., Semiconductor Products Department Booth #29
1224 W. Genesse St., Syracuse 4, N. Y.
Transistors and Rectifiers.

Gorham Manufacturing Co.
Booth #93
Elmwood Station, Providence 7, R. I.
New Gorham designed slip ring assemblies. Fabricated and cast microwave components and electro-mechanical assemblies manufactured to customer's design. Services include most types of metal fabrication quality controlled from raw material through finishing and testing. Foundry, machine shop and assembly departments constitute chief facilities operating in one plant.

Gramm Trailer Corp.
Booths #120, 121
425 E. O'Connor Ave., Lima, Ohio
Trailers, custom-designed for electronic equipment.

The Hallicrafters Co. Booth #74
4401 W. 5th Ave., Chicago 24, Ill.
The Hallicrafters Company exhibit will feature a new single sideband transmitter incorporating the most recent Hallicrafters' development—a 5.0 mc quartz crystal filter. In addition, a new matching 1 kilowatt amplifier utilizing ceramic tubes will be displayed. Hallicrafters' latest, high performance SSB receiver also will be shown.

► **See ad on page 128** ◄

Hoffman Laboratories, Inc.
Booths #109, 110
3761 So. Hill St., Los Angeles 7, Calif.
Washington office: Room 1022, Cafritz Bldg., 1625 Eye St., N.W., Wash. 6, D. C.
Air Navigation, (TACAN), communication, and test equipment. Includes Hoffman beacon simulator; single sideband transmission and reception; ECM tuning techniques.

Homelite, a Division of Textron, Inc.
Booth #108
Port Chester, N. Y.
Exhibit will highlight lightweight Homelite engine—generator sets specifically designed to meet the latest MIL specifications. Featured will be a new, highly efficient acoustical housing, developed to match Homelite Military engine—generator sets for use in field operations where minimum audio noise levels are required.

Hunter Mfg. Co., The Booth #124
305525 Aurora Rd.
Solon, Ohio
Heating and winterization equipment.

Hycon Eastern, Inc.
Booths #116, 117
75 Cambridge Pkwy., Cambridge 42, Mass.
Communications, data handling are enhanced by new crystal filters, by test instruments like part-in-a-billion Ultra Stable Oscillator* and Phase-Locked Klystron*; and by the rapid data-access Timing Generator* and high speed Tape Search Unit*. Communications systems planning and installation now cover public, private customers in U.S., 12 foreign countries including microwave, scatter, wire, and intricate switching, storage facilities. (*new products)

Institute of Radio Engineers
Booth #122
1475 Broadway, New York 36, N. Y.
"Proceedings of the IRE", IRE Directory, Convention Report, Professional Group Transactions, Membership Information.

► **See ad on page 149** ◄

Instruments Publishing Co.
Booth #115
845 Ridge Ave., Pittsburgh 12, Penn.
A new pubication, Military Automation; Instruments and Automation Instrument & Apparatus News; Handbook and Buyers Guide; Computer Handbooks; Electronic Control Handbook; The Automatic Factory; Process Control; Applications of Industrial PH Controls and other books.

International Radiant Corp.
Booth #123
Low Temperature Division
4 Manhasset Ave., Port Washington, N. Y.
Designers and manufacturers of environmental test equipment to MIL-JAN specifications and to individual standards. Test chambers are available for: temperature exercisers, altitude chambers, humidity chambers, sand and dust, explosion chambers, sunshine chambers, rain chambers, salt spray, salt fog, fungus chambers, dry ice chambers, vacuum ovens, low temperatures, high temperatures, plastic bell jar, diaphragm exercisers, liquid hot and cold baths, immersion tests, walk-in room for all environmental, and test chambers with vibration panels. Among our leading manufacturers in government and commercial operation.

► **See ad on page 82** ◄

Jodon, Inc., F. R. Booth #53
8510 Beech Tree Rd., Washington 14, D. C.
Plug-in units, tranducers, vacuum tube and transistorized AC & DC meters, various recorders, tape, directs writing, strip chart, galvanometer, etc. Preamplifiers, electronic filters and chain amplifiers, airborne equipment such as power supplies, amplifiers, voltage regulators, etc., electron tube short detector.

Kay Electric Co. Booth #46
14 Maple Ave., Pine Brook, N. J.
Instrument test equipment: sweeping oscillators 50KC to 1000MC, noise figure measure equipment, transistorized audio oscillator and video amplifier. *New*—vari-sweep model radar sweeping oscillator 10-145 MC with variable marker and crystal marks at fundamental.

► **See ad on page 104** ◄

Kin Tel (Kay Lab) Booth #136
5725 Kearny Villa Rd., San Diego 12, Calif.
High ambient noise TV system. Includes 1985CN Ruggedized Camera, ACH-6 Acoustical Housing, ARC-10A heavy duty Pan and Tilt unit, and ARM-14R Monitor. Drift-free DC instrumentation with 111A DC amplifiers. 202B microvoltmeter for measuring microvolts to kilovolts. New 204A Electronic Galvanometer. New 301 voltage standard.

► **See ad on page 72, 73** ◄

Kleinschmidt Laboratories, Inc., a subsidiary of Smith-Corona, Inc., Deerfield, Ill. Booth #20
Exhibiting printed communications equipment. Operating display will include page teleprinters, typing reperforators, tape transmitters and complete station teleprinter sets.

Lenkurt Electric Co., Inc. Booth #51
1105 Country Rd., San Carlos, Calif.
Lenkurt features new 4-channel miniaturized all-transistor carrier system prototype for Signal Corps: visual and audible demonstration of circuit noise eliminator with Lenkurt compandors, Lenkurt 45BX single-sideband frequency division carrier equipment. Used in Texas Tower communications.

► **See ad on page 47** ◄

Lewyt Manufacturing Corp.
Booths #49, 50
43 - 22 Queens St., L. I. City 1, N. Y.
Exhibit highlights: major components and sub-assemblies of the SAGE system in the fields of data transmission and remote display, as well as radar test equipment; also shown will be the Lewyt-manufactured mechanical components such as detent drives, precision tuning cavities, and variable capacitors.

► **See ad on page 2** ◄

Mack Electronics Division, Inc.
Booths #139, 140
1120 So. 2nd St., Plainfield, N. J.
Audio level meter ME-83( )/U, control monitor C-1737/GRA, telephone set TA-263/PT, radar set AN/APN-22, digital building blocks.

► **See ad on page 95** ◄

UMI

Maryland Electronic Mfg. Corp.
Booths #151, 152
5009 Calvert Rd., College Park, Md.
New Products: Transistor power supplies, standard horns, precision beacon transmitters, filters, scatter antennas, telemetering components, coaxial directional couplers, and bipolarized broad band horns. Also beacon and radar antenna systems, ground navigational systems, diplexers, circularly polarized antennas, frequency stabilized power supplies, servo-driven antenna pedestals, instrument landing systems, VOR systems, crystal mounts.

► See ad on page 127 ◄

Miles Reproducer Co., Inc. Booth #3
812 Broadway, N. Y. 3, N. Y.
Displaying miniature conference recorder—records in closed briefcase. No wires or plugs. Picks up voice within 60 feet. Screens surrounding noises. Voice-activated . . . starts-stops at sound of voice, automatically. Standard dry batteries used. No exposed microphone. Indexed groove finder. Built-in loudspeaker. Ideal for recording in car, train, plane—in the field, office, conferences, dictation, two-way telephone. Records for a full 4 hours.

Monroe Calculating Machine Co.
Booth #155
Hanover Ave., Morris Plains, N. J.
Monroe Automatic Internal Diagnosis (MAID), magnetic storage drums and heads, and other Monroe products.

Motorola Communications and Electronics, Inc. Booth #48
4501 W. Augusta Blvd., Chicago 51, Ill.
Motorola Military Electronics Division will show: Typical unclassified items of equipment indicating our experience in communications equipment, beacons etc. Transistor applications and their effect on new designs will also be illustrated.

► See ad on page 41 ◄

Mycalex Corp. of America Booth #18
125 Clifton Blvd., Clifton, N. J.
Supramica 555 ceramoplastic for components operating at 500 deg C.; Supramica ceramoplastics and Mycalex glass-bonded mica insulation; Synthamica synthetic mica; Mycalex TM commutation switches for telemetering and similar applications.

► See ad on page 115 ◄

Nems-Clarke, Inc. Booth #73
919 Jesup-Blair Dr., Silver Spring, Md.
Exhibit highlights the Nems-Clarke line of special purpose receivers operating in the frequency range of 55-260 MCs and a special telemetry receiving rack; new spectrum display unit, preamplifier, and multicouplers; TV rebroadcast receivers; field intensity meters; cam keyers; shield mounts.

► See ad on page 88 ◄

Northern Radio Co., Inc.
Booths #77, 78
143 - 9 W. 22nd St., N. Y. 11, N. Y.
New regenerative repeater: Embodies such features as "floating" input and output circuits—neutral or polar operation—acceptance of 47% mark or space distortion. Other advanced frequency shift communications equipment on display will be frequency shift keyers, converters, twinplex units, dual diversity receivers and tone telegraph terminals.

► See ad on page 121 ◄

Panoramic Radio Products, Inc.
Booth #107
10 So. 2nd Ave., Mt. Vernon, N. Y.
New spectral power density analyzer, synchronous frequency analyzer, telemetering indicator and frequency calibrators, sweep generators and subsonic through microwave spectrum analyzers.

► See ad on page 74 ◄

Park Nameplate Co., Inc.
Booth #143
34 - 10 Linden Place, Flushing 54, N.Y.
Exhibit shows anodized aluminum foil nameplates with special adhesive backing. Also demonstrates special application machines and methods for the different Park Nameplate adhesives.

Phelps Dodge Copper Products Corp.
Booth #7
300 Park Ave., N. Y. 22, N. Y.
Foamflex coaxial cable, lightweight, low loss; copper center conductor, foamed polyethylene dielectric, tubular aluminum outer conductor. Also styroflex, spirafil coaxial cables and fitting accessories.

Philco Corp., Lansdale Tube Div.
Booth #112
Lansdale, Penna.
Complete line of Philco transistors, including the new Micro-Alloy transistor. Also a special display of military type and special-purpose type tubes.

► See ad on page 77 ◄

Pic Design Corp. Booth #4
477 Atlantic Ave., East Rockaway, N. Y.
New issue catalogue — featuring over 4000 items for immediate delivery: all precision gears, shafts, couplings, hangers, speed reducers, differentials, bearings, dials, and out precision kits for laboratory, university and research development.

Production Research Corp.
Booth #130
Thornwood, N. Y.
Research, development and production facilities in electronics, electromechanics and optics. Featured will be "Magic Mike," a successful wireless microphone.

Radio Corporation of America, Defense Electronic Products Div.
Booths #34, 35, 36
Front & Cooper Sts., Camden 2, N. J.
Leader in electronics for the Armed Forces—airborne fire control systems, guided missile systems, communications, radar, navigation and television systems.

► See ad on page 125 ◄

Ramo-Wooldridge Corp. Booth #43
5730 Arbor Vitae St., Los Angeles 24, Calif.
The Ramo-Wooldridge Corporation conducts research, development and manufacture of electronic systems.

Raytheon Mfg. Co. Booths #103, 104
103 River St., Waltham 54, Mass.
Raytheon will be showing the latest developments in communications equipment, magnetrons, klystrons, the new amplitron and many things recently declassified.

► See ad on 4th cover ◄

Rixon Electronics, Inc. Booth #96
2414 Reedie Dr., Silver Spring, Md.
One recent development is a binary systems error counter. Unit will be in operation at show utilizing simulated radio circuit to evaluate circuit performance with various signal to noise ratios.

► See ad on page 136 ◄

Science Electronics, Inc. Booth #131
195 Mass. Ave., Cambridge, Mass.
The complete line of EREC-TRONIC Training and Development devices, new pre-employment training kits BE-3 and BE-4; two research and development tools, the E-5 and the E-10 to aid development engineers.

Skydyne, Inc. Booth #52
River Rd., Port Jervis, N. Y.
Standard stock size molded fiberglas mobile instrument case, design development and production in sandwich material or molded fiberglas of specially designed electronic instrument transit cases, instrument cases, reusable containers and spare parts cases, test stands.

► See ad on page 138 ◄

The SoundScriber Corp. Booth #66
146 Munson St., New Haven, Conn.
New in the field of long-time recording of voice communication circuits is the S-124 Magnetic Tape Recorder/Reproducer. Records continuously, unattended for 24 hours without tape change—24 hours of recording stored on tape

reels 2" wide, 3¾" in diameter. Also displayed are SoundScriber's disc dictating and recording equipment.

Sperry Gyroscope Co.
Booths #58, 59, 60
Great Neck, L. I., N. Y.
From Microwave Electronics Division: Microline(R) subsystems and equipment, ranging from single miniaturized components to complete microwave systems—plus complex antennas, microwave circuitry, precision test equipment, and checkout instrumentation. From Electronic Tube Division: High-power traveling wave tubes, klystron amplifiers and oscillators for radar transmitters, communication, telemetering and guidance systems. Also metal traveling wave tubes for special applications.

► See ad on pages 70, 71 ◄

Star Expansion Products Co.
Booth #2
142 Liberty St., New York 6, N. Y.
JE-31 (27-hole) tube pin straightener and JE-24 (26-pin) wiring plug for use in straightening special tubes. Also inline straighteners for printed circuit connectors.

Stelma, Inc ***Booth #33***
196 Henry St., Stamford, Conn.
New transistorized telegraph communications equipment will be demonstrated. Telegraph signal generators, automatic distortion monitors, tone keyers, electronic relays, telegraph distortion analyzers, regenerative repeaters and inline electronic repeaters. Recent developments in transistorized voice frequency telegraph systems will be exhibited.

► See ad on page 92 ◄

Stewart-Warner Electronics
Booth #144
1300 No. Kostner Ave., Chicago 51, Ill.
Datafax is a modern facsimile communication system providing instantaneous transmission of any printed material from point to point by means of land lines, radio, or microwave facilities. Copy is electrically recorded and is permanent, error-free, and unalterable.

Stromberg-Carlson, a division of General Dynamics Corp.
Booths #71, 72
100 Carlson Rd., Rochester 3, N. Y.
AN/ARN-21 tactical air navigation equipment; AN/SPA-23 radar indicator; electron beam pick-up featuring D-C response from magnetic tape; automation display showing automatic electronic equipment assembly; AN/GRC-65 mobile communication equipment.

► See ad on page 135 ◄

Superior Electric Co. ***Booths #8, 9***
83 Laurel St., Bristol, Conn.
Superior Electric features POWERSTAT variable transformers and STABILINE automatic voltage regulators.

► See ad on page 143 ◄

Sweet Mfg. Co. ***Booth #154***
84 Dunham St., Attleboro, Mass.
Wide range of precision miniature parts, various metals (special, precious and common alloys). Sizes, shapes will be shown; complete production and fabricating facilities explained. Product applications in communications, missiles, vacuum tubes, transistors, instruments, radio, radar, computers, fire control, electronics, automotive, and others.

Sylvania Electric Products, Inc.
Booth #145
Waltham, Mass.
Sylvania's Electronic Systems Division is engaged in multi-million-dollar projects for all the Armed Services involving research, development and production activities in the fields of guided missile systems, digital computers, operations research, product engineering, electronic components, electronic countermeasure systems, radar, communications, reconnaissance, and navigation systems. As one of its major activities, Sylvania developed the passive defense system for the Air Force's B-58 Hustler, America's first supersonic bomber.

Technical Materiel Corp., The
Booths #23, 24
700 Fenimore Rd., Mamaroneck, N. Y.
Communication equipment, both transmitting and receiving, SSB equipment, remote control equipment, antenna couplers, terminal units, and transmission line equipment.

Teletype Corp. ***Booths #75, 76***
4100 Fullerton Ave., Chicago 39, Ill.
Teletype 60 character per second punched tape system demonstrates operations of certain Teletype units of interest in automation and data processing. Also new transistorized time-division multiplex set for combining up to 4 Teletype communication channels and transmitting them simultaneously.

Times Facsimile Corp. ***Booth #102***
540 W. 58th St., N. Y. 19, N. Y.
Washington office: 1523 L St., N.W., Washington 5, D. C.
New Faxwriter message facsimile equipment; Weatherfax facsimile communications equipment for weather maps and charts; new portable precision chronometer, accuracy 1 second/12 days, many other features.

► See ad on page 58 ◄

Universal Transistor Products Corp. (Formerly Universal Atomics Corp.)
Booth #147
143 E. 49th St., N. Y. 17, N. Y.
Tiny transistorized electronic DC to DC power supplies for military electronics. Any practical combination of voltage and current to 125 watts from inputs up to 28 volts, in lightweight units that fit in the hand. Also rackmounted versatile units, and transistorized circuitry and devices for military applications.

► See ad on page 140 ◄

Western Electric Co.
Booths #15, 16, 17
120 Broadway, N. Y. 5, N. Y.
Mechanical precision in electronics, an operative demonstration of waveguide bending used in the manufacture of complex military electronic systems; precision manufacture of gyroscopes, printed circuits, and gears.

► See ad on page 55 ◄

Western Union Telegraph Co.
Booths #81, 82
60 Hudson St., N. Y. 13, N. Y.
Demonstration of new application of integrated data processing to payroll processing by Western Union private wire system. Intrafax (facsimile) equipment will be displayed and demonstrated.

► See ad on page 67 ◄

Westinghouse Electric Corp., Electronics Division ***Booths #105, 106***
Friendship International Airport, Baltimore 3, Md.
Radar and communications equipment for military applications is featured.

► See ad on pages 106, 107 ◄

Westrex Corp. ***Booth #70***
111 8th Ave., N. Y. 11, N. Y.
Airborne radio teletype, point to point radio transmitter and Divatel radio teletype receiving equipment.

Zoomar, Inc. ***Booths #5, 6***
55 Sea Cliff Ave., Glen Cove, L. I., N. Y.
Live demonstrations of remote controlled Zoomar ITV lenses, 360° panoramic cameras using standard 70 mm film, special optics for long range photography, boresight camera assembly for radar.

Bell & Gossett Co. ***Booth #118***
Dualex Division
8200 N. Austin, Morton Grove, Ill.
Entirely new Dualex ground-to-air selective calling system with functional control system.

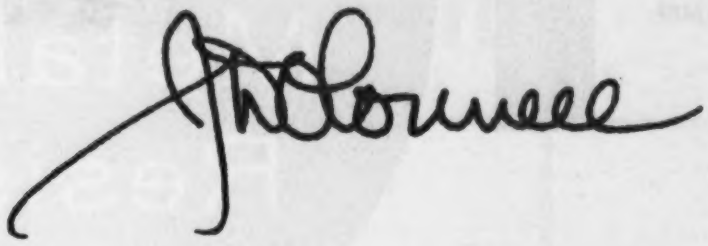
→ *Cargo Packers Inc., Booth #119*

Radio Engineering Products, Booth #139 ←

★ ★ ★ ★ *service communicators send greetings*

Maj. Gen. James D. O'Connell, USA
Chief Signal Officer

Any evaluation of the forward strides made in the field of military electronics during the past decade cannot but consider the part which the Armed Forces Communications and Electronics Association has played. It is a world-wide organization with a closely-knit industrial-military affiliation. From this bond of unity has come not only progress but from it has also sprung a strong feeling of tradition and a solid foundation of support for communications and electronics in the military services. The theme, "Marconi to Mars," is symbolic of AFCEA's aggressive and forward-looking program—one which assures its own steady growth and that of the Military-Industry Team.



★ ★ ★ ★

The 1957 AFCEA Convention theme, "Marconi to Mars," has particular significance to those of us who have been associated with naval communications-electronics. There are some now living who can recall Marconi's first wireless transmission for the U. S. Navy; all may well be aware of the recently announced first reception of electromagnetic signals from the planet Mars by the Naval Research Laboratory.

These pioneer achievements exemplify the remarkable advances through the intervening years in the related fields of communications and electronics by the partnership of American industry and the Armed Forces. Spurred on by the requirement to meet new problems and by the challenge to excel, this effective industry-military team, I am confident, will continue to produce valuable and startling results and open wider the window of knowledge, to the mutual benefit of both partners and to the Nation as a whole.

The importance of communications and electronics grows daily. Our Association has a responsibility to see that this increasing importance is recognized, and that new developments, as they occur, are made known and utilized in the best national interest.

RAdm. Henry C. Bruton, USN
Director of Naval Communications

★ ★ ★ ★

Just as the Armed Forces Communications-Electronics Association this year is marking, through its theme, "Marconi to Mars," a half century of achievements in communications-electronics, the growth of military aviation is being recognized by a "Golden Anniversary" program.

Fifty years ago the aeronautical and communications-electronics fields were considered completely unrelated insofar as their application to warfare was concerned. Only an insignificant handful of people really had the imagination to visualize that either would have any significant impact on the nature or conduct of warfare. History has proven the validity of their thinking. But more significantly, time brought with it a gradual appreciation which accelerated, with the lessons of World War II, the interdependence of both fields, one upon the other, until today military air power as we know it represents an inextricable fusion of both. This, from my point of view, is what is most significant about the AFCEA's 1957 theme—"Marconi to Mars."

Maj. Gen. Alvin L. Pachynski, USAF
Director, Communications-Electronics

New IRC® Metal Film Resistors

Type MEF

Type MEC

FEATURES

• Available in 1/2 and 1 watt ratings • Metallic resistive film accurately controlled and applied to special high quality ceramic cores • Designed to surpass characteristic A of specification MIL-R-10509B • Low noise level independent of range • Voltage coefficient can be disregarded

Here are molded metal film resistors that set new standards of performance—units that will withstand full load at 125° C. ambient to zero at 175° C. In addition to high initial accuracy, these new MIL type units combine a stability on load and a low, controlled temperature coefficient never before available in film resistors. They also provide low inductance and shunt capacitance plus excellent high frequency characteristics.

Small in size and weight, IRC precision metal film resistors can replace precision wire wound resistors in many applications. They are available in five temperature coefficient spans for maintaining or controlling resistance over wide temperature ranges. They can be used where high stability must be obtained under difficult load and humidity conditions. You'll also want to investigate them for high frequency applications. Send for complete details.

Insulated Composition Resistors • Deposited and Boron Carbon Precistors • Power Resistors • Voltmeter Multipliers • Ultra HF and Hi-Voltage Resistors

Wherever the Circuit Says

Low Wattage Wire Wounds • Resistance Strips and Discs • Selenium Rectifiers and Diodes • Hermetic Sealing Terminals • Insulated Chokes • Precision Wire Wounds • Potentiometers

IRC

SEND TODAY FOR COMPLETE DETAILS

INTERNATIONAL RESISTANCE CO. Dept. 543, 401 N. Broad St., Philadelphia 8, Pa.; *In Canada:* International Resistance Co., Ltd., Toronto, Licensee

UMI

NEWS COMMUNICATIONS

PIGEONS to FACSIMILE

By Fred E. Meinholtz

Director of Communications
New York Times

COMMUNICATION MEDIA USED BY NEWSPAPERS TODAY has progressed an incredibly long way from the methods Julius Reuter used for getting his start in Germany in 1849. Today, we have multiple channel cables—the most recent of which provides 31 voice and 12 telegraph channels—multiple high frequency radio, telephone recording devices, facsimile, and other fast and modern forms of communication which we employ regularly and almost without a thought. Julius Reuter—you may remember—used homing pigeons to get his early start.

In the year 1849—not so different from 1957, may I sadly add—there was a great deal of trouble abroad on the continent of Europe. Revolutions and minor insurrections were breaking out continuously. In the streets of the three great continental monarchies there were barricades to be seen, and not a little desultory shooting to be heard. The governments of Paris, Vienna and Berlin were all assailed by popular movements. Against this turbulent background Julius Reuter began to move.

Pigeons Fill Gap

He was interested in the science of telegraphy from its start. He watched the opening of Germany's first public telegraph line between Aachen—a name made world famous in World War II—and Berlin with an eagle eye. His astute mind noted that there was a gap between the terminus of the German system at Aachen and the terminus of the French and Belgian systems at Verviers. It was a short gap, not over thirty miles to be exact, but it meant a good deal to Julius Reuter and, through him, to the world. For he saw that if the gap could be bridged, there would be a profit for the bridger.

Julius Reuter organized news gathering agencies at both Verviers and Aachen and bridged the thirty-mile gap with a pigeon post. His busy homing pigeons, winging their way across the gap, paid rich dividends. They also brought Mr. Reuter an intangible thing—prestige. Reuter's reports, at that time, dealing only with economic and commercial matters, began to be quoted with authority on the stock exchanges of France and Germany.

Perhaps Mr. Reuter had a special way with pigeons, for I have been reliably informed that on the first occasion when homing pigeons were employed in the last World War, they were a failure.

That was at a place called Sened Station in Tunisia, where American and Axis tanks and infantry were locked in one of the early battles of the war. It was before teletypes were employed for transmission directly from the front fighting lines. Army public relations officers, in combination with the Signal Corps, decided to test the use of homing pigeons in flying news flashes on the result of the battle from Sened Station to a place several hours back by jeep, called Feriena, where more effective communications facilities were available.

Brought to the advanced posts where the correspondents were crouched in fox holes at Sened Station, the three homing pigeons became the subject of controversy. It was decided to draw lots to see in what order the pigeons assigned to the Associated Press, the United Press and the International News Service would be released. The AP man won, the United Press man was second and the INS man last.

Amidst a flurry of bombing by German stukas, the pigeons—in the decided order—were released just after American infantry took Sened Station.

What happened was that the INS pigeon, the last to leave, arrived first, but I am sorry to relate, he took longer than the jeeps did over rutty, bumpy desert roads. The AP pigeon turned up at base almost twenty-four hours later, obviously proud of himself. The bitter deduction of the AP correspondent involved was that the

(Continued on page 29)

The Author

F. E. Meinholtz is now Director of Communications and Manager, Syndicate News Department, for *The New York Times*, and Director of Press Wireless, Inc. Active in the field for many years, he is one of the most distinguished men in communications today. He is a veteran, member of the American Legion, VWOA, and many clubs.

"All the News That's Fit to Print"

The New York Times.

FACSIMILE EDITION
Transmitted by facsimile from New York and printed in San Francisco
August 20, 1956

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15 or More Nations Are Said to Favor Establishing International Control

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Turning Point May Come Today—New Opposition Is Shown by Soviet

By HAROLD CALLENDER
Special to The New York Times.

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The New York Times
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Major Political Group Says Coalition in Rabat Spurns Goals of Nationalists

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Harriman Supports Protest on Form of Request to Build Power Plant

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Seek to End Deadlock

By its action the authority sought to break a deadlock over public or private development that has lasted more than five years. A Senate reservation in the 1950 treaty between the United States and Canada gave Congress the right to decide whether the development should be under public or private aus-

4 U. S. NEWSMEN AWAITED IN CHINA FOR 30-DAY TOUR

Red Agent Reports They Will Visit Despite the Objection of State Department

By GREG MacGREGOR
Special to The New York Times.

HONG KONG, Aug. 19—Representatives of four United States news-distribution agencies are planning to enter Communist China Thursday despite the State Department's refusal to approve their visit, the China Travel Bureau said today.

The manager of the bureau said he had confirmed reservations for James Robinson, of the National Broadcasting Company; John Roderick, of The Associated Press; Robert Miller, of the United Press, and Keyes Beech, of the Chicago Daily News Foreign Service.

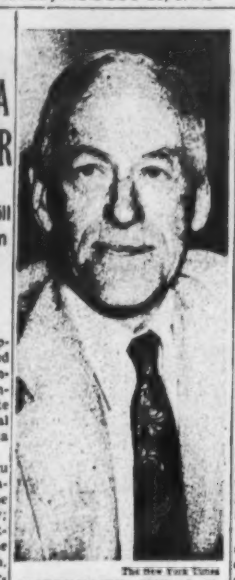
The travel bureau spokesman said it was his understanding that employers of the four correspondents had agreed that they could proceed into China without official approval from the United States Government.

The manager of the travel bureau added that any qualified United States correspondent would be welcomed by Communist China if he was able to produce "acceptable" identification, and evidence that his employer had directed him to cross the Chinese border.

British Money to Be Used

He said the original thirty-day-tour invitation would be extended to sixty days if formal application was made to the Foreign Ministry in Peiping. He said he hoped more United States newsmen would accept the invitation, which was extended to reporters of newspapers, magazines and radio-television networks and news agencies.

The correspondents planning to enter Red China indicated that they intended to carry



The New York Times
WITHDRAWS: Millard E. Tydings, who announced his withdrawal yesterday as Maryland's Democratic candidate in the Senate race.

STEVENSON TO USE TRUMAN SERVICES

Finnegan Says Advice Will Be 'Utilized All the Way Down the Line'

By WILLIAM M. BLAIR
Special to The New York Times.

LIBERTYVILLE, Ill., Aug. 19—James A. Finnegan, Adlai E. Stevenson's campaign manager, said tonight that former President Harry S. Truman would "be utilized all the way down the line" in the Democratic Presidential campaign.

"We hope to have his [Mr. Truman's] advice and counsel"

TYDINGS GIVES UP RACE TO REGAIN HIS SENATE SEAT

Maryland Democrat, Target of McCarthy in '50 Bid, Heeds Doctor's Advice

By The Associated Press.

HAVRE DE GRACE, Md., Aug. 19—Millard E. Tydings withdrew today as Maryland's Democratic candidate for the Senate. He said his health made it "impossible for me to conduct a vigorous campaign."

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Continued on Page 4, Column 5

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Mr. Stassen, however, has continued to see a 50-50 chance that the final ticket will have Gov. Christian A. Herter of Massachusetts as the President's running mate.

The other question was civil rights, a problem that bothered the Democrats in Chicago last week. Southern Republicans have balked at a strong platform endorsement of the Supreme Court's anti-segregation decisions and have threatened a floor fight they could not possibly win.

PROPOSED PLANK SUPPORTS ISRAEL

G.O.P.'s Tentative Platform Offers Help Against Attack But Is Silent on Arms Aid

Text of the tentative foreign policy plank. Page 5.

Pictured above is the facsimile edition of New York Times; pictured below is the Times' regular city edition.

"All the News That's Fit to Print"

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LATE CITY EDITION
Condensation of U. S. Weather Bureau forecast: Mostly fair today, cooler tonight. Mostly fair tomorrow.
Temperature range today: 59—66.
Temperature range yesterday: 57.2—75.
Full U. S. Weather Bureau Report, Page 47.

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POLICE HUNT WAY TO COMBAT GANGS; POLL 254 CITIES

Juvenile Delinquency Study Covering Nation May Bring Change in Method Here

Possible revision of New York City police procedures for combating juvenile crime hinges on findings in a survey that will be completed soon.

Capt. Frederick J. Ludwig, new commander of the Juvenile Aid Bureau, said yesterday that the department had polled 254 major cities in the United States and Canada on practices and techniques in this field.

Analysis of the answers has been going on for weeks, and it is now estimated that a composite picture can be drawn before the end of the month.

Captain Ludwig said that on the basis of analysis to date, "redeployment of personnel" in several units, including his own, seemed likely.

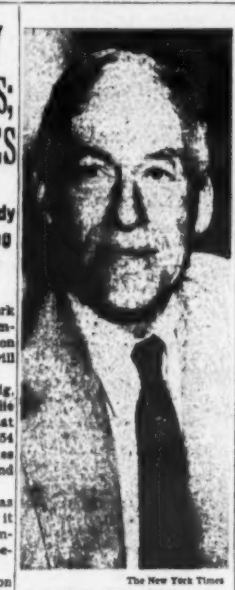
The survey addressed 287 specific questions to the police forces of all cities over 100,000 population and selected smaller cities. It is said to be "the most extensive survey on juvenile delinquency ever made in the United States."

Kennedy in Dual Role

Police Commissioner Stephen P. Kennedy undertook the survey in a dual capacity, since he is also chairman of the committee on juvenile delinquency of the International Association of Chiefs of Police.

Captain Ludwig, an authority in the field, said after appearing as a guest on Columbia Broadcasting System's television program "Eye on New York" that the department would not embark on "any foolish experiments."

"We're going to employ meth-



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THUG IS SHOT DEAD IN PARK AVE. DUEL

Two Confederates Seized—Policeman Injured as Cafe Hold-Up Effort Is Foiled

A masked robber was killed and two of his confederates were captured in a pistol battle with the police last night after the three had attempted to hold up a midtown Park Avenue restaurant.

Police Sgt. Howard Brunn

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pigeon had met a lady friend and spent the evening with her. The UP pigeon never turned up. Another bitter correspondent—faced with the alternative that his pigeon was a war casualty—took the position in a heated argument that it was most likely that it had landed on some Arab's farm and become a squab.

Hampered—as we sometimes are even in this day of the "Iron Curtain"—by European restrictions on press use of telegraph, Mr. Reuter moved to London and became a naturalized British subject. He had trusted agents in all the capitals of Europe and these agents occasionally were asked to supply pieces of political information or to clear up some diplomatic obscurity.

Realizing that there should be a broader outlet for his reports than financial and commercial houses, he tried to sell Fleet Street (still today the great London press center) on taking his reports. The Press, still translating its reports from editions of European newspapers, was polite but unimpressed.

It took eight years and a news-beat, made possible by clever use of fast communications, to change Fleet Street's mind. At that time Paris was still the only continental city in direct communication with London. Over the Paris-London telegraph, Reuter's agent reported the ominous words used by the Emperor Napoleon III to the Austrian Minister to France at the New Year's Day reception at the Tuileries Gardens. This foreshadowed the Italian campaign and the long struggle for the union of Italy.

The Emperor's remarks, when printed in Mr. John Walter's *Times*, alarmed Europe, set stock exchange prices tumbling and assured the success of the first international news service.

Canister Communications

When the American Civil War—or shall we say the war between the States—broke out, there was no cable to America. Mr. Reuter worked out a system whereby the latest dispatches from the war front were placed aboard ship in tin canisters at the last possible moment at New York. They were thrown overboard to be picked up by Mr. Reuter's swift cutters waiting off Crookshaven, at the southwestern tip of Ireland. If they were tossed off a ship at night they burned a blue flare.

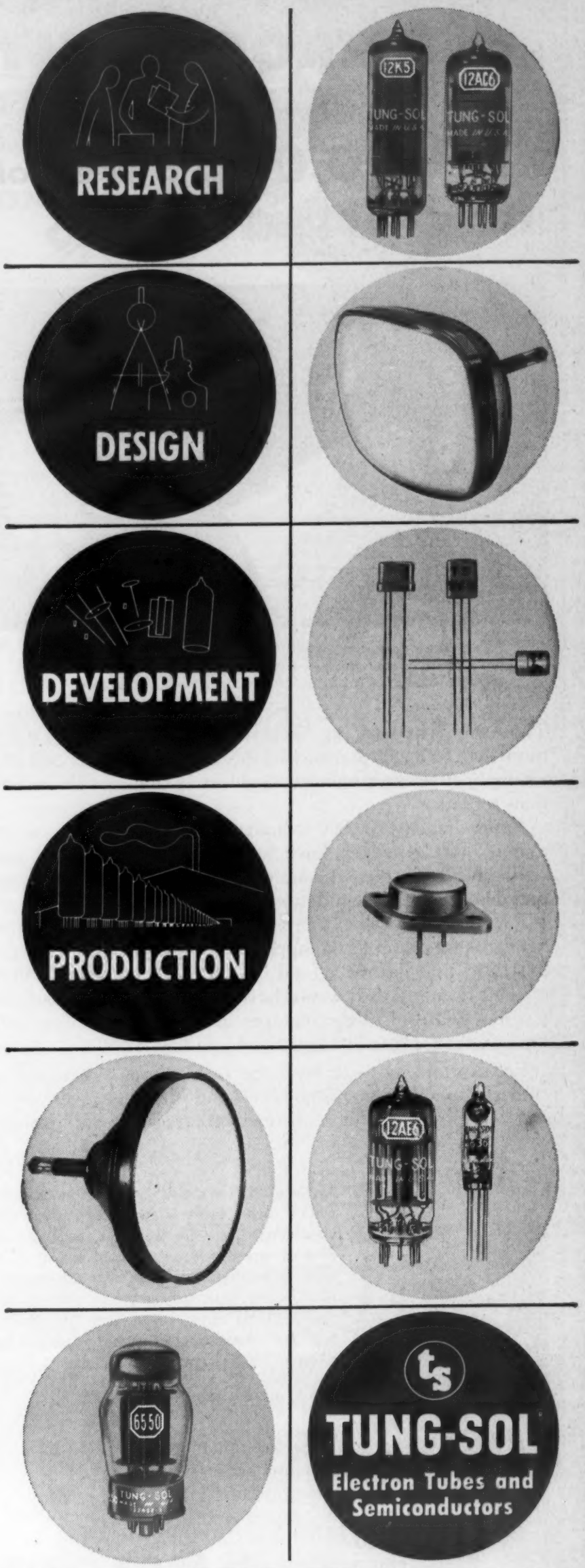
Across miles of wild southern Irish country from Crookshaven to Cork—where the message could be retransmitted to London—a special telegraph line was constructed.

One of the most dramatic of the many news beats this system made possible for the people of Britain and Europe (avid for news of what was going on) came at the end of the war.

Reuter's New York correspondent received a vital report. He chartered a special boat and took off with a canister after a mail packet that had just left port. He caught the ship and tossed the canister aboard. Off Ireland, it was tossed to another Reuter's man, who went rapidly ashore in a small boat.

Thus for a full week, before another ship arrived in Britain, the British and the European world knew only through Reuter's that President Lincoln had been assassinated at Ford's Theatre in Washington. And Reuter's had a full report. Another example of how important fast communications are in news gathering and dissemination.

I have mentioned Reuter's so much in the early part of this narrative only because Julius Reuter was the first man to recognize this fact and apply it. He was the first to see that faster and faster communications were coming



HOW XEROGRAPHY

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save $500,000 a year for the U. S. Army Signal Corps

Photo shows typical 24"x36" drawing. Subject is reduced onto offset paper master (right) by xerography to 11"x17" size for runoff of multiple copies on offset duplicator.

The Army Signal Supply Agency, Philadelphia, Pa., is saving more than $500,000 annually by the use of xerography and offset duplicating in reproducing engineering drawings for invitations for bids.

Approximately 200,000 invitations are mailed each year to some 15,000 suppliers. Each invitation contains documents setting forth contractual conditions, specifications, and drawings describing the item desired.

For the Army Signal Corps' dramatic mortar locator, the MPQ-10, for example, 65 suppliers were solicited, each receiving 1,973 drawings or a total of 128,245. The reproduction method formerly used would have required 250 manhours at a cost of $6,040. Using xerography and offset duplicating, job time was reduced to 107 hours and cost only $2,180.

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and that the world was to grow smaller and smaller. Today, great newspapers, such as (and I hope you will not mind my taking pardonable pride in this) *The New York Times*, and a number of world-wide press associations, are bringing a mass of reports on vital matters to the public quicker and in greater volume than ever before.

I cannot emphasize too much, however, that the backbone of the whole process is quicker and cheaper communications. There is a saying among newspaper correspondents that no story, no matter how important, is any good unless you can get it to the office.

We all remember the tale of the correspondent in the Crimean War. In those days, once a reporter was filing a story, no other correspondent could cut in on the cable line until it was completely filed. This man reached the office first and filed pages of the Bible to his paper until he had his story written, thus holding open the one line available for his copy alone.

There is another side, however, to this story.

I was acquainted with Floyd Gibbons, the fast-talking newspaper correspondent and radio commentator, who was one of the most colorful of several generations of correspondents. The fact that he wore a black patch over an eye he had lost in World War I as a result of German machine-gun fire near Chateau-Thierry, added to his distinctive personality. Old-timers will remember his staccato, rapid-fire delivery once he took to broadcasting.

His correspondence to the news organizations he represented at various times was as verbose as it often was pithy. He went out to cover the Japanese invasion of Manchuria for INS and he sent back long—in fact extremely lengthy—dispatches at the cost of no less than 22 cents a word. The copy flowed into the INS office in reams.

On March 1, 1932, INS headquarters in New York received a dispatch from Floyd which read simply:

> "Biggest story of the war. Japanese advance on all fronts. Lindbergh baby kidnapped. What the Hell? Gibbons."

Not another word came through. Gibbons learned the hardest lesson for any correspondent—WHEN not to go to the cable office. A story certain to swamp his had broken and he knew enough to act accordingly.

No Communications, No Story

You readers are all aware that, during the European campaign in the last war, communications were so highly organized that correspondents not only had the teleprinter facilities at corps headquarters, but, in many cases, down to division levels. I believe that one division, the Eighty-Second, had a rule in its public relations set-up that a jeep would be available to take back one piece of copy, if necessary, at any time of the night, as well as the day.

The final excellent communications effect, however, was due to the first difficulties and experimentation that the correspondents, the Army communications people—and those in charge of purely press communications—went through in the early part of the war, starting with the African campaign.

In the Pacific, where jumps of hundreds of miles forward from one Army base to another were being made, usually with no communications that could be repaired and utilized on arrival, the situation was more difficult and complicated.

For instance, the correspondents who went ashore at Saipan at considerable danger to themselves, had made what they—and the Navy Public Relations people for

(*Continued on page* 32)

close support

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Strategic Air Command's annual Bombing-Navigational competitions are the "World Series" of bombing tests. B-47 teams from Strategic Air Command bases throughout the country, flying thousands of miles in simulated bombing runs, performed remarkable feats of navigation and precision bombing. The culmination of long months of ground and air training, the bomb scoring results obtained were the best in the history of the competition. SAC teamwork, highly trained crews, and the most advanced navigational and bombing equipment all contributed to the gratifying results obtained.

Data for determining the accuracy of the bombing runs was computed by the MSQ type of Command Guidance System, designed and built by Reeves Instrument Corporation. Tracking by radar, the system provides a continuous plot of the plane's ground position. The point of bomb release is plotted, and from it the point of impact determined to a very high degree of accuracy. The MSQ type of system can also be adapted to Command Guidance of fighter bombers for close support bombing and strafing of enemy positions.

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REEVES INSTRUMENT CORP. *A SUBSIDIARY OF DYNAMICS CORP. OF AMERICA,* 215 East 91st ST., New York 28, N. Y.

that matter—thought were excellent arrangements to have their copy carried to a communications ship and sent home quickly by high speed transmitters. The Japanese fleet, however, came out to take one of the several major lacings to which it was submitted. To the consternation of the correspondents, their pockets jammed with copy and notes, the Fleet just moved off, to meet the enemy, of course, and they were left as high and dry and isolated as Robinson Crusoe. The story was no good without communications.

Again, when MacArthur made his return to the Philippines, it was a story not only of importance, but, after Bataan and Corregidor, replete with the drama from which General MacArthur was never completely disconnected.

In that case, the Army somehow or other obtained an old icebreaker. I think it had been built in 1887 for the Atlantic iceberg control. It was taken to Sydney, Australia, and fitted to make possible transmission from the beachhead at Leyte Island direct to San Francisco. To assure its arrival on time, the old icebreaker, which travelled slowly, was sent with one of the first convoys to leave Dutch New Guinea for the Philippines.

The landings were made very early in the morning. *The New York Times* had two men there, and one of them filed a story at 10:30 A.M. aboard the communications ship. It was one of the first stories filed by anyone. All day, under hectic conditions and amidst enemy bombings, the operators on the communications craft transmitted copy. It was not, however, until 10:30 in the evening, Leyte time, that the first story of the landing was received in San Francisco. Atmospherics had been bad, and all copy filed for the first twelve hours was lost, including one of our major stories. Again—no communications, no story.

My job on *The New York Times* is to see that our communications are arranged on the most rapid, and at the same time, the most inexpensive basis. Any newspaper or press association can afford to spend just so much for communications and the cheaper the price per word, the more words we can obtain to better serve our readers.

Transmitters Cut Costs

A long time ago, in order to beat down cable and radio costs which were very high, we formed Press Wireless, a company designed to provide facilities to the press at a cheap cost per word. I do not want to go into the details of that operation now. We were, however, not only able to provide economical transmission, but cable and radio companies, facing this competition, cut filing costs from Europe, Asia and South America—from all over the world in fact—to a fraction of what they had been.

In addition to establishing cheap toll service, Press Wireless pioneered in the organization of transmission of press to multiple destinations. Radio is an ideal medium for this method of news dissemination.

Today, the AP, UP and the International News Service, leasing transmitters on a fixed-time basis, transmit simultaneously to hundreds of clients throughout Central and South America, Europe, Africa and Asia. The transmission cost probably averages much less than a cent a word, and this small cost is assessed against the many clients subscribing to the service.

To operate not only intelligently, but economically and successfully, the Press has kept abreast with the most modern technological developments in the field of electronics and transmission facilities generally. It is about some of these developments, and particularly telephone recording and facsimile, that I want to record a few serious words.

During World War II, as early as the African campaign, we handled a large amount of war news by telephone recording. In order to provide enough circuits for the press to move the large volume of news in which the public was interested, Eisenhower's staff allotted part of the voice broadcast time at Radio Algiers to the newspaper reporters. This provided the fastest way to handle late news and our own, and other pressmen used it a great deal.

The Associated Press and the United Press, as well as *The New York Times*, had to catch these spoken words. The OWI helped out on numerous occasions, but was not staffed to do this always. To do the job accurately and expeditiously it was, of course, necessary to employ recording machines.

In the late stages of the Pacific War, a considerable amount of press copy also was telephoned from the Far East to San Francisco, where RCA caught it and transmitted it on to New York.

Telephone Recordings

On at least one major occasion, the use of voice transmission was highly important to us. One of our men obtained the first post-war interview with Emperor Hirohito, seeing him even before General MacArthur did and getting an expression of the Emperor's views on the post-war situation and his desire to cooperate with the Americans.

Our man arranged to have the interview an hour and a half before our edition time in New York. That did not give him much leeway, but he did not want others to hear of the interview until it was published at home.

When he arrived at Radio-Tokyo to write, he found that the circuits were out between downtown Tokyo and the transmission station outside of that capital, as far as radio message transmission was concerned. The voice circuit was operating, however, and a PRO officer stepped into the breach. He "voiced" the story to RCA in San Francisco which rushed it on to us. We had a world beat.

As a matter of fact, telephone recording was widely employed by newspapers and press associations for specific purposes beginning in the early 1930's, so this war use was no novelty to us.

The New York Times and the *Chicago Daily News*, for instance, were telephoning almost all copy from continental capitals to Paris, during the Thirties. After the German invasion of Paris, *The New York Times* transferred its telephone recording system to Berne, Switzerland.

It was worth its weight in gold to us several times, especially the night the Germans invaded Yugoslavia. There were only two special correspondents of American outfits in Belgrade at the time—Ray Brock of *The New York Times* and Cecil Brown of the *Columbia Broadcasting System*.

With German bombs screaming down and exploding on Belgrade, they worked in relays to collect information. That night, Brock telephoned 17,000 words, under most dangerous conditions, to our office in Berne where it was recorded, transcribed and re-telephoned to New York. I may not be modest about this, but it gave *The New York Times* another great beat.

The reason for having correspondents telephone from continental capitals to Paris and London before the war was the high transatlantic cable and radio rates then in effect. To transmit direct from the Balkan States to New York at that time cost 17 cents to 25 cents a word. From

(*Continued on page* 34)

The AN/MPQ-4 is a mobile radar mortar locator which accurately determines the location of enemy mortars in a matter of seconds.

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Today's U. S. Army Signal Corps is vital to an army whose *power for peace* is based upon unprecedented firepower, mobility, and control.

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The Signal Corps' dual capability as a technical force and a fighting force offers tremendous opportunity for the young man desiring a career packed with challenge, action and advancement.

The young Signal Corps fighting man uses and helps develop such advance electronic systems as the AN/MPQ-4 mortar locator, which was designed for *front line battle operations* and makes possible the location and destruction of the aggressor's firepower. The highly effective AN/MPQ-4 was developed by the Signal Corps in close cooperation with the HMEE Department of General Electric.

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Paris, however, ordinary press rate was but five cents a word and, for the larger news enterprises which had a high word volume, special rates were obtainable running as low as one cent a word.

The telephone rates from all over Europe to Paris were comparatively cheap and the service fast. The latter could not be said, in most cases, of the telegraph and radio services.

Recording Equipment

Since the war, the telephoning of copy to the United States has fallen into disuse by most organizations as a result of an action by the Federal Communications Commission and the American communication companies in reducing press rates from all European points to this country to approximately the same level. The only exception to this rule is London, from which press copy moves at two cents a word to New York City and at one pence sterling to Canadian cities. That rate is still low enough to justify a considerable amount of copy from the Continent, and from British owned and mandated territories, to be forwarded to London for teletype transmission to New York.

Several types of telephone recording equipment are available. The one used by the Paris Office of *The New York Times* before the War was developed by a German and known as the Dailygraph. It was based on the Pulson invention and contained about 5,000 feet of fine gauge steel wire. The recorders contained two sets of magnets through which the wire passed. When set in a recording position the first magnet through which the wire passed demagnetized that section of the wire completely erasing the previous voice recordings. The second set of magnets recorded the voice modulations. The same recording instrument was used for transcribing. In transcription the first set of demagnetizing magnets is neutralized so the voice recording remains unaffected. The second set of magnets works in reverse, passing the audible voice modulations through the amplifiers, thence, to the transcribing operator's headset.

Recording and transcribing are at the same rate of speed. When the transcription speed is not synchronized at the recording speed, the pitch of the recorded voice modulations is changed, making the recording unintelligible.

Since the transcribing operator cannot operate a typewriter at dictating speeds, a sentence or phrase is typed and the recorder stopped by means of a pedal until the operator catches up. A tap or two on the foot treadle also backspaces the recorder—permitting the operator to listen time and again to the same word or phrase until he deciphers it.

The New York Times in New York started using a recorder based on the same principle manufactured by the Bell Laboratories. These recorders used a narrow steel tape rather than a steel wire and passed through the magnets at a greatly reduced speed. Other American counterparts of the Dailygraph are available under various trade names. Sensitized paper tapes have largely replaced steel wire. Speech recorders were widely used by the Army during the War for dictating orders, recording speeches to be broadcast and like matters. In some cases, wire reels were flown by plane many hundreds of miles from the scene of action to the nearest reproduction center hundreds of miles away.

There are also cylinder and disc recorders, employing aluminum, celluloid, plastic, paper, film and acetate discs. Many correspondents can easily dictate at 125 to 150 words a minute. The over-all speed is about 100 words a minute, counting interruptions in which the operator listening in at the receiving end asks for repeats on words or phrases which are not clear.

The Ediphone and the Dictaphone, the first widely-used recording devices, were still being employed on a large scale during the past war. The Germans, for their part, used sensitized paper tape, on which magnetic recordings were made. *The New York Times* now uses Gray Audographs which employ plastic discs to record the voice modulations.

An operator listens in on our machines as a correspondent dictates and he calls for a repeat on any part of the message he thinks the machine may not have caught. The machine plays back at the same speed at which the correspondent spoke and the operator transcribes the message in copy form. He can play back as many times as he wants and thus assure accuracy.

During the San Francisco Conference of 1945, at which the United Nations Charter was drafted, a facsimile edition of *The New York Times* was printed for the delegates and press representatives at the Conference. The four-page facsimile edition was transmitted across the continent every day without a single failure. Those receiving the paper found it under their hotel doors every morning when they arose for breakfast. A format was made up in New York and it was transmitted by AP Telephoto to San Francisco, one-half page at a time. Each half-page film, approximately 5 x 7 inches, required fifteen minutes for transmission. At San Francisco the two films were joined and blown up to full page size by rephotographing. The photographed format was rushed by motor to a newspaper plant where an etching was made, a matrix taken therefrom and a stereotype struck off and then affixed to the cylinders of the presses for printing.

Covering Republican Convention

Eleven years later, August 20 through 24, 1956, for the duration of the Republican National Convention, *The New York Times* again published a facsimile edition at San Francisco. In contrast to the speed and size of the 1956 facsimile transmissions, the transmitting and receiving drums of the 1956 apparatus were fast and large enough to handle two full sized newspaper pages in one transmission. The transmission time for the two pages required four minutes. Because of modern improvements in equipment and full size page transmissions the definition of the reader's copy was four times greater than the 1945 results. Ten full pages were printed nightly and for transmission the microwave relay system or coaxial cable of the American Telephone & Telegraph Company normally employed for television programs was utilized.

San Francisco readers, in congratulating *The New York Times* on its ingenuity and enterprise, made no comment at all on the quality of engraving and printing in the finished facsimile product. The casual observer did not seem to notice any great difference between the original product and the facsimile copy. The paper was fully legible even to the small type in the stock tables.

Moreover, probably not a single reader realized that in the transmission of the copy across the continent the electric eye of the facsimile transmitter examined only 1/200 inch square area of the newspaper page at a given time nor that the speed of scanning was so rapid that 120,000 such scans were examined each second of transmission.

Surely news communications have gone a long way toward perfection since the canister and homing pigeon days of Julius Reuter.

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WESTERN ELECTRONICS LOOKS AHEAD

By H. Leslie Hoffman
President, Hoffman Electronics Corporation

ELECTRONICS IN THE WEST, like Spring, is busting out all over. This is self-evident from the statistics (see box on page 39). A comprehensive story of the history, present status and future of West Coast electronics would take several volumes; however, I will attempt to boil down what I feel to be the significant phases—past, present and future—particularly as they pertain to military electronics.

The Beginning

This growth of electronics in the West is part of the new America, with its new products and its new population movements to Suburbia. It reflects the dynamics of America on the move both technologically and and geographically.

It has been a unique and exciting experience to be in the middle of this growth of electronics on the West Coast in the last 15 years. The tempo has been fast and promises to accelerate. The challenges have been many and the problems of growth exacting, but the opportunities of the future are most stimulating.

The growth of West Coast electronics can be divided into six phases. During Phase 1, or the pre-Pearl Harbor era, the radio industry, as it was then known, consisted of three radio manufacturers in the Los Angeles area, together with several small component companies. We made 2% of the Nation's radios and consumed 16% in the West. We concentrated on price and smaller sets, on one hand, and on the deluxe high quality sets on the other.

In San Francisco during the pre-Pearl Harbor era the industry was built around special purpose tubes. Very few companies existed in the Seattle-Portland area or in the San Diego area.

This was the beginning of our industry as we know it today. Western electronics, like most Western industry, has had to rely on new ideas and new concepts and the adventurous spirit of Western people to thrive.

World War II Period

At the beginning of Phase 2, or the World War II period, all military radio and communications systems in the country were manufactured by a few companies on the Atlantic Coast. One of the Government's first moves was to expand activity in the East. Later the aid of radio set and component manufacturers in the Middle West was enlisted. But the far West was designated an invasion area. In addition, the strategy was to channel all available manpower into the aircraft and shipbuilding industries.

Collective Approach

Placing contracts with Western electronics firms was actually looked upon with disfavor. This problem was common with all West Coast manufacturers. After considerable discussion and several meetings, it was decided to try the collective approach. This envisioned a cooperative effort of pooling facilities and know-how and expanding the component phase inasmuch as it was lack of components rather than final assemblers that was the restrictive factor in the production of military equipment at that time. The West Coast Electronics Manufacturers Association was formed to harness this collective effort and I was privileged, in 1943, to become its first president.

Contract Channeling

Our West Coast companies began to supplement their individual efforts with data on the locations, capabilities and facilities of the entire industry as well as their own. It is interesting to note that the first major contract secured on this basis, which incidentally was awarded to our company, stipulated that we produce or procure at least 90% of the dollar content in the West. This requirement was met. This established the

The Author

H. Leslie Hoffman, the founder and first president of West Coast Electronics Manufacturers Association, is a major spokesman for and sponsor of the West's electronics activity. He is a past president of RETMA and is now head of the Electronics Committee for the Chamber of Commerce and a Trustee of the University of Southern California.

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leader-follower concept which will be touched upon later.

Additional contracts were channeled to other end equipment companies and, by the end of World War II, the Western segment of the industry was firmly established. Annual billings in California alone had increased from $25 million per year in 1942 to more than $400 million in 1945.

During this period there were several other significant developments.

Military Moves West

One was that the industry developed a close association with the scientists of Western universities and colleges that has constantly grown.

Another was that the Military began to recognize the West as an engineering center. The Navy started a program that eventually resulted in the expansion of its own engineering activities in San Diego, Inyokern, Point Mugu, and Pasadena. The Air Force established large Western testing facilities and moved its overall long-range planning group to Santa Monica. The Signal Corps established West Coast offices for close coordination with its contractors and, more recently, a large testing base at Fort Huachuca, Arizona. This movement of the Military in turn sparked a new spiral of growth for West Coast Companies.

Post-War Years

During Phase 3, or the post-war years (1946-50), the emphasis changed rapidly. Industrial companies tried to establish or re-establish their products in consumer and commercial markets. The military emphasis in the meantime was on disposing of war goods surplus. But the nucleus of national defense know-how remained. Some companies, such as our own, seeking to break new scientific barriers, continued to maintain their military electronics departments. Significant developments of the late war months—such as rockets, nuclear energy electronic activities and guided missiles—were carried forward on a research and development basis.

Research Expansion

It was during this period that today's concepts of Systems Management were first introduced to the Military by West Coast people—an

(*Continued on page* 38)

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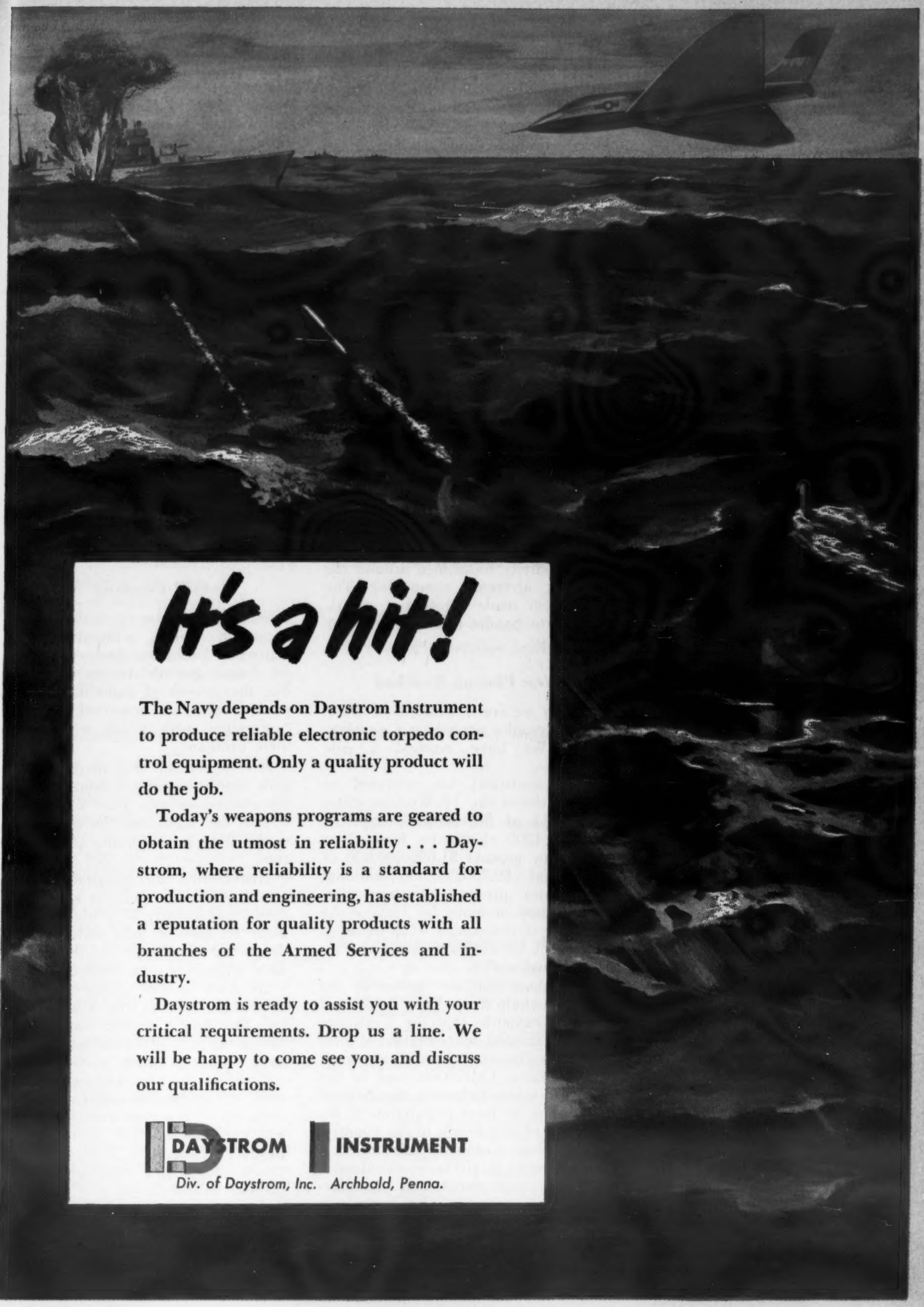

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outgrowth of our earlier cooperative approach.

It was also during this period that the airframe manufacturers began to recognize the significance of electronics to both guided and manned aircraft.

The general level of manufacturing output at this time only slightly exceeded the level at the end of the war. But the character of goods and services, both military and commercial, had changed radically.

Significant research activities in the San Francisco area again centered around tube developments, and the expansion of research and development centered around both universities and industrial research departments.

Mobilization Plan

Phase 4, or the Korean War period, found West Coast electronics on a priority par with other sections of the country for the first time.

During the period from 1946 to 1949, a committee from RETMA, on which I had the privilege of serving, developed a mobilization plan to be used on an if-and-when basis. Many significant phases of this plan were utilized in the basic mobilization plan adopted by the Military. It encompassed a philosophy of establishing a strong electronics industry on the East Coast, in the Middle West, and on the West Coast so that the country would not be dependent on any given area at time of emergency in the future. At the time of Korea, West Coast companies, as a result, were called upon to expand materially their military engineering and production capacity.

Industry Doubles

Another significant phase of this mobilization plan utilized the so-called leader-follower concept that was used so successfully on the West Coast during the early part of World War II.

Equipment produced during this period was largely the next generation of that produced during World War II. But even as it was being produced, research spawned still a third generation. This new plateau of accomplishment gave increased consideration to the rapidly accelerating speeds, reliability, temperature requirements, miniaturization, and mobility required of the nuclear and thermo weapons of today.

During this time (1950-54) our industry doubled in volume each year. It was the period of our greatest percentage growth.

Recruitment of engineers and scientists began on a grand scale. The Military, recognizing this expanded capability, increased its dependence on West Coast firms. New concepts, ideas, products and services initiated here won wider and wider acceptance.

Burst of Activity

It was during this period that a new company started business every week. In the Los Angeles area the new components, products and services they offered centered around airborne equipment, both manned and unmanned, data processing, instrumentation, communication and navigation.

In the San Francisco area the new burst of activity centered around research in the universities and on expanded use of new specialized tubes and components.

In the Seattle-Portland and San Diego areas new services, components, sub-assembly and instrumentation activity blossomed around the growing airframe companies. The West also made substantial contributions to Sandia and other nuclear activities.

New Plateau Reached

Today we are in Phase 5 of Western electronics growth and development. We have reached a new plateau.

The statistical box referred to earlier shows the 11 Western states with 641 of the Nation's approximately 4200 electronics firms. Last year they grossed $1,690,000,000 of the total $9,700,000,000 national electronics product. Western electronics now accounts for 15% of the number of companies, 16% of sales, and 18% of employment in the industry nationally.

But these statistics, again, do not tell the whole story. They do not tell us, for example, that the West now has the greatest concentration of electronic engineering talent of any area. In Southern California, and in the San Francisco Bay Area, the ratio of engineers to total population is the highest of any locale in the country. In Southern California electronics is second only to airframe manufacturing in employment and manufacturing significance. Approximately 12% of all persons employed in manufacturing plants in the area are in some phase of electronics work.

Today the West is a combination of both old and new companies—some just building reputations, some with nationally established reputations—engaged in a wide variety of electronic activities, from large Weapon Systems Management teams and Weapon Systems manufacturers through the entire spectrum to small specialized component or sub-assembly suppliers.

The West has become a major research and development center. Practically every engineering symposium or meeting finds representatives from Western companies presenting papers covering new approaches or new ideas in electronics. There have been many outstanding achievements in data processing, missiles, instrumentation, communications, navigation, countermeasures, semi-conductors, magnetic amplifiers, and a whole host of specialized components, and significant new products and services are coming to light almost daily. And, as reflected by the statistical table, electronics is in the forefront in every area as far as new manufacturing facilities are concerned.

Still Growing

Such spectacular growth cannot occur, of course, without raising many new problems. And, of course, the future growth of the industry, like the growth of individual companies, will be measured by the competency with which we handle these problems.

It is significant that many people with highly developed know-how in the electronics arts have elected to live in the West, and the movement to the West is continuing at a rapid rate.

Historically, the greatest growth occurs where the greatest know-how exists, particularly in a highly technical art such as ours which is not dependent completely on the immediate adjacency of a market.

As long as the people in these companies here in the West recognize that they have the challenge of competing with other companies who have similar products or services to sell within the area and outside the area, and as long as they continue to come up with a higher creative content per dollar or per pound in the product or services that they are rendering their customers, this growth will continue.

Competition

Another problem that must be faced is the migratory engineer. The

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game of musical chairs being played by our engineers today is hardly conducive to industry growth and stability. Substantial steps are being taken individually and collectively to correct this situation and the results indicate that this situation can be corrected.

Leaders in the engineering profession should accelerate their efforts to remind their people of their responsibility to their country, community and their companies as well as to themselves in this over-all program, and call a halt to the opportunist approach of too large a segment of their group at the present time.

Survival

Based on the record of the past, only one out of four of the newer companies in electronics will survive in its present form. The other three will merge, be absorbed, consolidate, or go out of business. This represents a challenge to electronics industry management that has yet to be met by many.

Many of the smaller companies are beginning to face the basic problem of making money in order to continue to grow and survive. Fiscal success is not always assured the entrepreneur whose lifetime has been spent solving technical problems.

Technological Challenge

Ninety percent of the growth of Western electronics has been built on the military dollar. We are still in a technological race with Russia. Electronics is playing a vital role in this race and will continue to do so but already there are rumblings that there is a limit to the price we can pay for technological supremacy. Here again the challenge confronts us that we must get a higher productivity from our management, engineering, and manufacturing teams per dollar, both in concept and end equipment, because this is one race in which we just can't afford to come in second.

Diversification

In many areas the community, through the teaming together of its Chamber of Commerce, universities and industry, is working out constructive programs to increase, both quantitatively and qualitatively, the flow of technical manpower into our industry and also to supplement individual company efforts in both on-

Box Score of Electronic Industry Statistics on the West Coast 1956

San Diego County:

1.	No. of Electronic firms	26
2.	Employment	2,300
3.	Sales	$ 30,000,000

Phoenix-Tucson Areas:

1.	No. of Electronic firms	13
2.	Employment	6,000
3.	Sales	$ 55,000,000

Portland-Seattle (does not include Boeing activity):

1.	No. of Electronic firms	12
2.	Employment	6,000
3.	Sales	$ 12,750,000

Los Angeles & Orange Counties:

1.	No. of Electronic firms	470
2.	Employment	73,000
3.	Sales	$1,000,000,000

San Francisco-Oakland & Peninsula:

1.	No. of Electronic Firms	75
2.	Employment	20,000
3.	Sales	$ 260,000,000
4.	Annual payroll	$ 80,000,000

Balance 11 Western States:

1.	No. of Electronic Firms	45
2.	Employment	9,500
3.	Sales	$ 192,000,000

TOTAL—Electronics Industry—11 Western States, 1956:

1.	No. of Electronic Firms	641
2.	Employment	112,000
3.	Sales	$1,690,000,000

TOTAL—Electronics Industry—USA, 1956:

1.	No. of Electronic Firms	4,200
2.	Employment	610,000
3.	Sales	$9,700,000,000

11 Western States as a percent of National Electronics Industry:

1. 15% of electronic firms
2. 18% of employment
3. 16% of sales

Principal Growth Areas

San Francisco-Peninsula Area

Expect the value of their electronic facilities to expand roughly 30%.

Value Electronics Facilities — 1956	$89,000,000	
New Facilities — 1957	$32,000,000	
Sales — 1956	$260,000,000	
Projected — 1957	$321,000,000	
Sq. Feet of Plant Facilities — 1956	3,500,000	
Projected — 1957	1,700,000	(an increase of 49%)

Los Angeles and Orange Counties

	New No. Units	Capital Investment	Expanded No. Units	Capital Investment	Total No. Units	Capital Investment
1956	24	$7,500,000	35	$31,200,000	59	$39,000,000
1955	20	8,796,000	51	24,469,000	71	33,265,000

Total capital investment for one year (1956) was roughly 40% of San Francisco area's total value of electronic facilities in 1956.

Box score is an estimate compiled by the Chamber of Commerce.

Standard types of COMMUNICATION EQUIPMENT

Radio Engineering Products is currently producing a number of types of equipment, electrically and mechanically interchangeable with standard Bell System apparatus. Complete equipments of the following types, and components for these equipments are available for early delivery.

CARRIER-TELEPHONE EQUIPMENT

C5 Carrier-Telephone Terminal (J68756). A kit for adding a fourth standard toll-grade channel to existing C systems is available.
C1 Carrier-Telephone Repeater (J68757)
121A C Carrier Line Filter and Balancing Panel
H Carrier Line Filter and Balancing Panel (X66217C)

CARRIER-TELEGRAPH EQUIPMENT

40C1 Carrier-Telegraph Channel Terminal (J70047C)
140A1 Carrier Supply (J70036A1, etc.)
40AC1 Carrier-Telegraph Terminal
Grid Emission Test Set (J70047D1)

VOICE-FREQUENCY EQUIPMENT

V1 Telephone Repeater (J68368F)
Power Supply (J68638A1)
V1 Amplifiers (J68635E2 and J68635A2)
V3 Amplifier (J68649A)
V-F Ringers (J68602, etc.)
Four Wire Terminating Set (J68625G1)
1C Volume Limiter (J68736C)

D-C TELEGRAPH EQUIPMENT

16B1 Telegraph Repeater (J70037B)
10E1 Telegraph Repeater (J70021A)
128B2 Teletypewriter Subscriber Set (J70027A)
Composite Sets, several types

TEST EQUIPMENT

2A Toll Test Unit (X63699A)
12B, 13A, 30A (J64030A), and 32A (J64032A) Transmission Measuring Sets
111A2 Relay Test Panel (J66118E)
118C2 Telegraph Transmission Measuring Set (J70069K)
163A2 Test Unit (J70045B)
163C1 Test Unit (J70045D)

COMPONENTS AND ACCESSORIES

255A and 209FG Polar Relays
Repeating Coils, several types
Retard Coils, several types
184, 185, 230A and 230B Jack Mountings

VACUUM TUBES

101D, F & L	323A & B	396A
102D, F & L	328A	398A
104D	329A	399B
205D	336A	400A
274A & B	350A & B	408A
281A	355A	120A Ballast Lamp
305A	393A	121A Ballast Lamp
310A & B	394A	

RADIO ENGINEERING PRODUCTS
1080 UNIVERSITY ST., MONTREAL 3, CANADA
TELEPHONE UNiversity 6-6887
CABLES RADENPRO, MONTREAL

job and off-job training. This program should be accelerated and expanded.

Our dependence on the Military is necessary but coupled with the lack of diversification into other fields, it also represents a weakness. Increased emphasis on extending techniques, know-how, new products, and new ideas into products and services for industrial and consumer usage is indicated. The more forward looking companies are recognizing this challenge and are acting to meet it. Up to this time, however, such activity has been on too limited a scale for the welfare of Western electronics as a whole.

Area For Concern

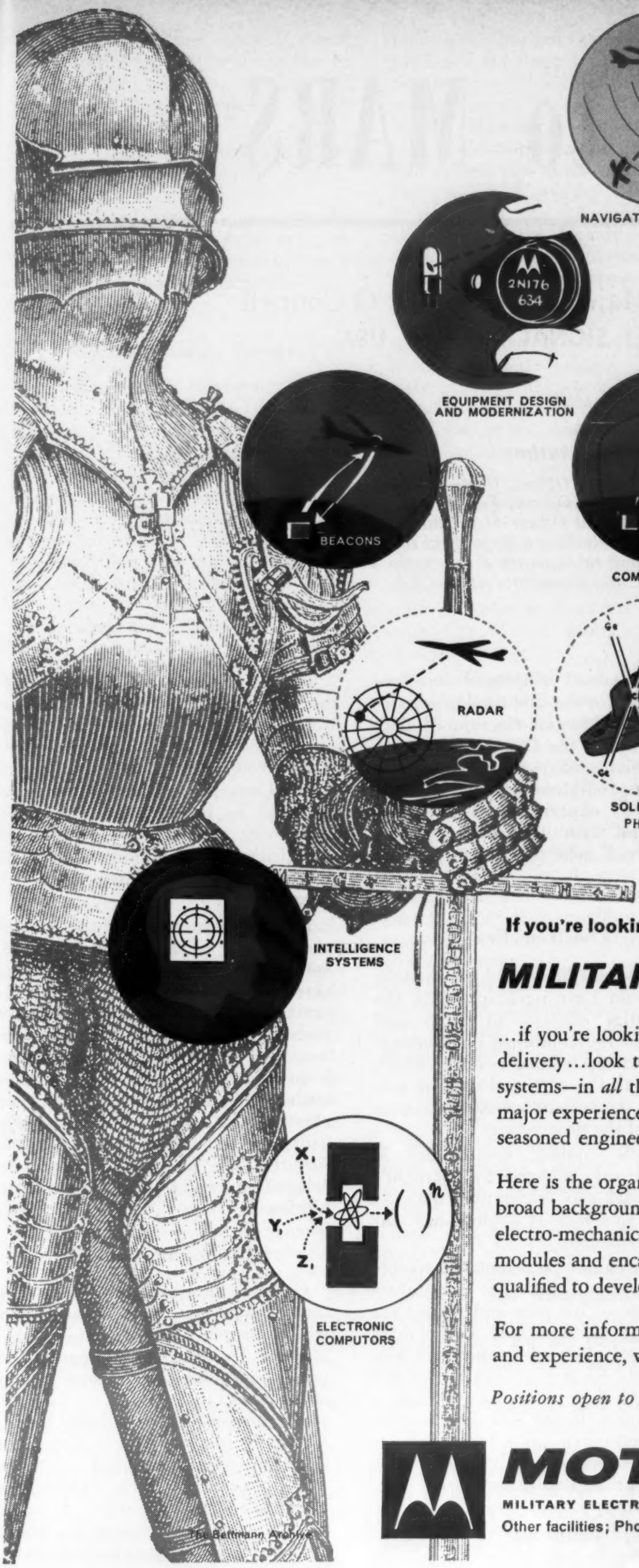
Another area for concern is the indication that many of the large projects now going through research and development on the Pacific Coast will result in manufacturing activity in some other area. This raises several important questions. One involves the challenge to various communities in maintaining manufacturers' employment. Another involves the challenge that will confront the Military in coordinating engineering and manufacturing—and make no mistake about this problem as the complexity of our weapons increases.

The very number of companies in electronics indicates the highly competitive nature of virtually every phase of the industry. Only those who can go forward on a balanced basis will survive even though the market is growing at an accelerated rate. The same aggressive attitude and fresh concepts that were instrumental in starting and building our industry must be applied to the future as well.

Growing Future

Our market analysis people tell us that we will have a $15 billion electronics industry nationally by 1965. If they are correct, and our Western segment of the industry faces its future realistically, its rate of growth should continue to be higher than the rest of the country. By 1965 the West's percentage of output should increase from 16% to 20% and its dollar volume increase by more than one-third. On this basis we can look forward to a $3 billion Western electronics industry within eight years.

Western electronics is young, vital and flexible. Its approach is as fresh as it is vigorous and its contribution to military electronics will continue to expand.



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marconi to MARS

by Maj. Gen. James D. O'Connell
CHIEF SIGNAL OFFICER, USA

The Author

Maj. Gen. O'Connell, Chief Signal Officer, USA, has been in the Signal Corps since 1928. He served in England, France and Germany during World War II, and became Signal Officer of the 8th Army in Japan in 1947. General O'Connell is widely known throughout the communications field and recently was elected to honorary membership in the VWOA. He is a member of the Executive Committee of AFCEA.

TODAY'S COMBAT COMMANDER MUST have control of his force. Without such control he is powerless. The destiny of every man in his unit and the outcome of a battle is not always within his grasp. In this Age of Electronics, he can strengthen his chances to gain this control and insure his probability of maintaining it.

Since the dawn of time, man has continuously sought to learn and keep within limits the physical forces about him so as to control better his own destiny.

Man and Mars

Two thousand years ago, man gazed in fear at a red star in the heavens. We know the star today as Mars, and we know no terror of it, for we have plumbed many of its secrets. But ancient man trembled, for he saw it as an unknown and powerful influence upon his destiny—one over which he had not the slightest measure of control. Such is the ultimate destiny of Man, however, that in less than twenty centuries, two guided missile experts of this era—Wernher von Braun and Willy Ley—basing their plans on astronomical realities and sticking strictly to engineering knowledge available today, could have outlined a master blueprint for Man's first exploring trip to Mars.

In the year 1900 — a date within memory of many who are today members of AFCEA — an Italian named Marconi employed wireless telegraphy for the first time in reporting the presidential election of that year. And in the last few years of a life which ended only two decades ago, this prodigious scientist devoted himself to experiments with short waves and with microwaves, which he believed held the secret of television.

The New Era

What would Marconi have thought if he could have participated in the presidential election of 1956 and have seen the combined communications and electronics systems which brought to the eyes and ears of millions of Americans an instantaneous record of the proceedings?

Today's combat commander is more directly affected by Marconi's early spark-gap transmitter than by early Man's fear of a blood-red star in the firmament.

Yet he cannot be completely remote nor unsympathetic. For his future and those of his men and indeed the future of all free men hinge upon how clearly he understands and how effectively he is prepared to resist a new Red Star. Moving through a giant orbit, it has left in its wake death and corruption. Its nature was revealed finally and completely in Hungary: a nature predatory and treacherous, with an unyielding determination to control the destiny of all mankind.

Today's combat commander is in the vanguard of those of the free world who have banded together to oppose the threat. As you read this, Army troops are stationed in more than 73 countries, helping these allies to build up their own strength for resistance, and in demonstration of America's determination to deter or to overcome any aggressive move by an enemy.

In an era marked by the virtual annihilation of time and distance, new concepts of military operations have had to be developed. New organizations and new techniques have evolved. Today's Army is in dynamic transition from cannons to missiles, from trucks to helicopters, from shoe leather to flying platforms, from field glasses to battlefield television. Along with new and unprecedented responsibilities, the Army has already developed new and unprecedented capabilities.

Command Control

Greatly increased firepower and mobility are part of a nerve system which insures a fast reaction time—a means for beating an enemy to the punch and dodging before he can strike back.

But firepower and mobility together do not insure victory. There is a third major requirement — Command Control. It is information about the battle situation. It is the means by which firepower and mobility can be coordinated and accurately

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directed. It is the element which enables an Army field commander to convert men, weapons, supplies and transportation into firepower, mobility and teamwork.

It is Communications and Electronics—rapid, reliable and responsive.

And these are but a few of the things which we in the Army and you in industry, university and laboratory are doing to improve Command Control.

Reconnaissance Drone

In the extremely important area of Combat Surveillance, the commander will have a radio-controlled reconnaissance drone. Directed by a controller while within sight and carrying a camera over enemy positions, it takes pictures and brings back target information. Out of sight of the controller, radar takes over and plots the drone's location. Returning home, the drone parachutes to the ground, the exposed film is retrieved, and within ten minutes the finished pictures are delivered to the commander.

Surveillance Tools and Communications

The new portable television camera constitutes an extension of the eyes of the commander far beyond his command post. Carried by a soldier in a forward area or installed in an Army aircraft covering an amphibious assault, the camera transmits essential and instantaneous information to the commander. This gives him a capability for decision based upon up-to-the-minute information of the battle and of the movements of enemy men or armor.

Ground combat photography is still an important surveillance tool. The new 100″ camera has an effective range of up to 30 miles. By means of this device, distant terrain and enemy assembly points can be made available for close observation.

Added to these means for surveillance of the combat area are infra-red and other sensory devices.

For communication, the Army is considering a program of re-equipping its men at every echelon: the individual soldier to be provided with a helmet radio set; transistorized radio equipment to replace the Handie-Talkie and Walkie-Talkie for the forward combat units, and the new vehicular radio equipment, new radio relay, and new scatter communication equipment for the higher echelons in the Field Army.

Electronic Data Processing has already gone beyond the great promise predicted for these systems. It is today being applied to antiaircraft operations in air defense. The Army's Missile Master, in current production, is a data-processing communication system that ties in with the Air Force's SAGE system. Data from SAGE is fed into the system as well as data from the organic long-range radar of the Missile Master and the radar of the NIKE batteries. Information is fed out to the battery commanders to orient their radars on incoming targets and advise them of which targets to engage. The complete status of targets and the NIKE batteries are presented to the tactical controller at the Antiaircraft Operations Center.

Computers Employed

This is an automation system which, as a tool in the hands of the Antiaircraft Commander and his staff, provides at least ten times the capability of any group of human processors!

In the logistical field, the Army's Technical Services are placing high priority on use of computers for inventories, stocks and requirements control at major supply and stock control points. The U. S. Army Signal Supply Agency in Philadelphia has in service a large commercial high-speed computer. It will eventually operate in a system using punch-card transceiver communication together with medium capacity computers at the four Signal Corps Branch depots.

It used to take up to six months to compile the stock status of the 150,000 different items in stock. Now it can be done in a single day.

New Equipment

With the Army having to rely upon increasing numbers of organic aircraft for reconnaissance and resupply, there is a need for navigational aids and traffic control equipment. In developing these equipments, we are using everything the Air Force and Navy have which is applicable to Army purposes. Our requirements for aircraft are, however, fundamentally different from those of our sister services with respect to size, weight and operational performance. Substantial numbers of new types of electronic equipment will therefore have to be developed and procured for use in Army aircraft. A new basic aircraft radio set is now being introduced, and we are testing ground-controlled navigational and landing devices such as omnirange and quad radar. We are accelerating development of self-contained navigational systems for Army aircraft, including doppler and inertial guidance.

Speed and Reliability

I have enumerated but a very few of the devices and systems which the commander will have available to him, and which the Army considers indispensable to the exercise of rapid and correct judgment by a field commander. The nature of modern warfare has placed a premium upon speed and reliability. In past wars, small margins for human errors were permissible. In future warfare, the margin for error and allowance for mistakes are sharply reduced, for speed of movement and the destructive effects of modern weapons are such that mistakes which used to have only marginal effects can now be catastrophic.

Desires and Realities

Human reaction time is too slow to cope with the realities of today's combat operations. The breach can only be filled by the products of the dynamic technology which the professional members of the Armed Forces Communications and Electronics Association represent.

It can in truth be said that Marconi did as much as any man in history to stimulate free man's imagination, his hopes and his confidence in the future. Marconi himself would never have tried to link his name symbolically with that of Mars.

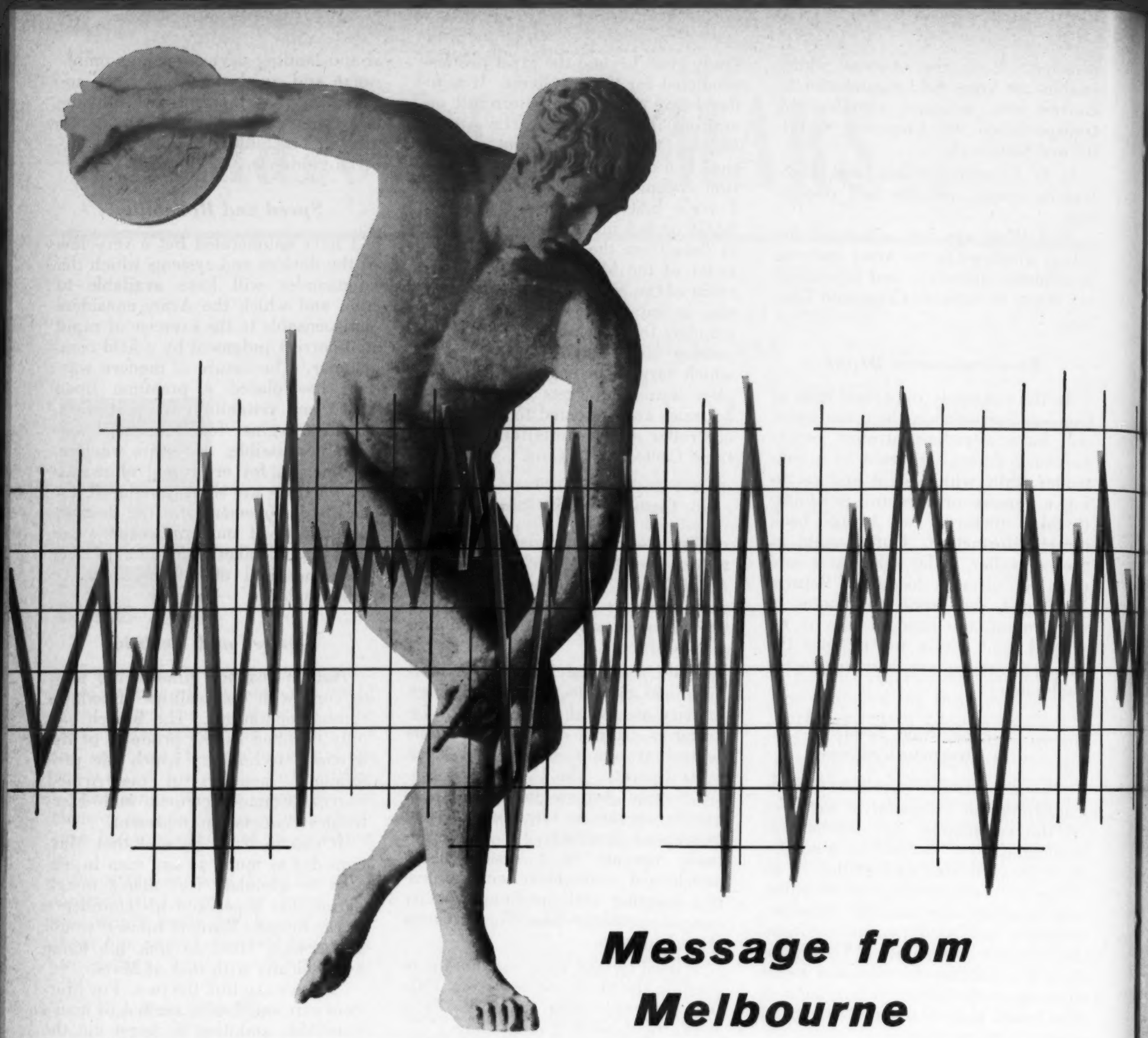
Yet, we can link the two. For Marconi can well be the symbol of man's insatiable ambition to ferret out the secrets of the universe, and Mars has ever been the symbol of man's aggressiveness, his soaring ambitions, his endless quest for greater — and now perhaps wiser—control over his own destiny.

Mars Awaits Man

Our children are about to become spectators of mankind's first tentative stabs at uncovering the secrets of outer space. What new additions to the reservoir of human knowledge and wisdom and to the ultimate betterment of humanity will come of it?

Mars, the age-old symbol of the God of War, sails serenely on his infinite path, and waits for puny man to cross the threshold.

It is a threshold over which—one day—we will pass.



Message from Melbourne

A recent short-wave broadcast from Melbourne, Australia . . . received in Syracuse, N. Y. (over 10,000 air miles) **with no perceptible flutter or fading** . . . is further proof that General Electric's new radio technique . . . Synchronous Amplitude Modulation*. . . is the solution to the problems of long-range radio operations. Its concept and operation are uniquely simple . . . SAM* is compatible with all present forms of radio equipment . . . its operators need no further specialized training . . . yet it preserves complex wave forms even while handling the Doppler effect. Its suppressed-carrier, double-sideband transmission and synchronous reception promise significant savings in weight and cost. Of paramount importance is SAM's* resistance to jamming and interference. Here again, is a vivid example of LMEE's invaluable contribution to progress... in furthering new uses for electronics.

For the very latest information on SAM* . . . write Section B

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— GOVERNMENT —

THE WORLD'S NORTHERNMOST CITY Since 1951, millions of U. S. dollars have been spent in the development of a protective cluster of air bases and radar stations at the top of the world. The northernmost airbase in the world is Thule, located only 800 miles from the North Pole in Greenland. Its' architect, Garnett Herwig, said recently that it is assuming the title of the world's northernmost city. Located in a valley between two mountain ranges on the edge of Greenland's huge ice cap with a steady wind and permanently frozen ground, techniques of construction are just the reverse of those usually devised. Pioneering work at Thule has provided architects and engineers with the ability to cope with other Arctic and Antarctic bases where the same rigorous conditions exist.

BRIDGES "FLY" AT FORT BELVOIR Bridges are literally flying at Fort Belvoir, Va., the U. S. Army's Engineering Center. The Engineer Research and Development Laboratories are conducting tests in an effort to give the Army the capability of moving bridge and stream crossing equipment to distant sites by helicopter. In test demonstrations, the H-21c helicopter, a light cargo carrier with a lifting capacity of 3,400 pounds, carried boats and bridges. A heavier helicopter furnished by the U. S. Marine Corps Base at Quantico, Va., demonstrated the capability of delivering a 5,600-pound assembled float. It then placed a 6,600-pound aluminum deck on it to form a complete bay.

CONTRACT AWARDS: The ARMY has awarded the following contracts: Texas Instruments, Inc., transistor frequency modulated oscillator, $35,111; Hycon Manufacturing Co., modified camera KA-20, $227,450; Brooklyn Polytechnic Institute, microwave instruments study, $44,275; Raytheon Manufacturing Co., electron tubes, $40,000; Varian Associates, electron accelerator, $625,000. The NAVY recently announced contract awards to: Elgin National Watch Co., timing mechanisms, $1,240,000; Bath Iron Works, missile carrying destroyers, $44,045,600; Westinghouse Electric Corp., cooling system for naval vessel, $7,513,000; Western Union Telegraph Co., modifying telegraph facilities, $2,181,790; U. S. Hoffman Machinery Corp., ammunition, $3,355,000; Allison division of General Motors Corp., reconditioning jet aircraft engines, $7,776,-661; Stavid Engineering Co., missile guidance system for submarine launching, $6,000,000. AIR FORCE grants include: Sikorsky Aircraft, Division of United Aircraft Corp., H-19D helicopters and spare parts, $2,717,000; Glenn L. Martin Co., flight testing of Matador missile, $1,527,981; Convair, Division of General Dynamics Corp., research and development, $1,474,950; Ray Aeronautical Co., aerial target drone and spare parts, $9,225,849; Boeing Airplane Co., reorientation of the WS 110A program, $3,250,000; E. I. Du Pont De Nemours & Co., methanol, $1,623,430; Avco Manufacturing Corp., T-53 engine development, $2,080,460; Standard Oil Co., starter cartridges for B-57 bomber engines, $3,412,593; Aeroil Products Co., Inc., spray outfits for cleaning, de-icing and decontaminating, $1,916,438; Lockheed Aircraft Corp., additional facilities for final assembly and production flight testing site for jet aircraft, $2,314,000.

— INDUSTRY —

I.R.E. CONVENTION HUGE SUCCESS SIGNAL extends congratulations to the Institute of Radio Engineers on its 45th national convention in New York City, March 18-21. A populace of 54,000 visited the giant New York Coliseum where remarkable achievements in the world of electronics and communications were displayed in 846 exhibits and discussed in some 250 technical papers. The Waldorf Astoria, where some of the technical papers were read, became home ground for many of the visitors. The four days unfolded, before the public, the story of electronic progress.

BORESCOPE APPLIED TO INDUSTRY The instruments with which doctors peer into patients' bodies now have been adapted by industry to probe for defects hidden in machinery and to read gauges inside atomic reactors. The long needle-like instrument known as the borescope—in effect periscopes with built-in flashlights—has become industry's newest tool. It is being used also to examine the interiors of airplane propeller blades, boiler tubes, and engine cylinders, according to the National Electric Instrument Co. of Elmhurst, N. Y., which manufactures them for the medical profession and industry. It has just developed a special lens system for them called the "Fontar" which enables all objects and areas within view to be always in focus, regardless of distance from the end of the instrument.

RCA MAKES THE CONGO TEST As a vehicle to test and subsequently advertise test results of 24 various products, RCA went on a "Safari" to the Belgian Congo. An RCA Victor Pocket Sized Transistor Radio (Model 8BT7) and a 7 Band Strato-World II Radio (Model 7BX10) were among the products subjected to the heaviest duty in the jungle. On land and in canoe, the transistor radio "operated perfectly," RCA reports. The Strato-World II served as a "calling card" at native communities in the Congo, bringing music from all over the world. All sets are said to have withstood the rigors of the 26,000 mile trip, exhibiting good reception and excellent performance and tone in this high humidity area.

ELECTRONIC TUBE GOLDEN ANNIVERSARY Control of the infinitesimal electron has made it possible for mankind to hear, see, feel, smell, calculate, and even talk. The history of electronics, commemorating the 50th anniversary of the patenting of the original electron tube, was shown in an exhibit at the I.R.E. National Convention in New York City recently. Known as the Princeton Tube Collection, probably the most comprehensive of its kind in the world, it consists of more than 6,000 tubes ranging from examples of the earliest "Edison Effect" to the most modern 600,000 watt tube. Included were samples of more than 40,000 different types of tubes that have been developed and their contributions to unlocking the mysteries of radar, television, x-ray and other electronic equipment.

— GENERAL —

"TOMORROW THINKERS" STUDY AVIATION The Republic Aviation Corporation now has an ultra-specialized staff of "tomorrow thinkers," organized after an international talent hunt, working on the problems of flight at speeds of thousands of miles an hour at altitudes 50 miles above the earth. The group, called the Scientific Research Staff, is primarily concerned with fundamental research vital to continued growth of aviation. It is maintained on a semi-academic basis so that it is free to explore developments in such fields as mathematics, general physics, nuclear physics, supersonics and thermodynamics.

COMPUTER TRANSLATES RUSSIAN INTO ENGLISH Developed at the University of Michigan is the Michigan Digital Automatic Computer (MIDAC) which deals strictly with the language of theoretical or experimental physics. It was noted that MIDAC translates Russian scientific fact into English but it won't translate the Russian fairy tales. The researchers predict, however, that it will even translate the fiction eventually. The magnetic drums of the machine have 64,000 Russian words and their English equivalents on record. As an operator types off a Russian scientific paper, the machine automatically types out the English equivalent.

FREQUENCY CONTROL SYMPOSIUM Attending the 11th Annual Frequency Control Symposium sponsored by the U. S. Army Signal Engineering Laboratories in Asbury Park, N. J., last week, were representatives from government, industry and educational institutions. Visitors from most of the free world nations were present. The purpose of the Symposium was to promote a better understanding and wider dissemination of technical information related to frequency control which was obtained during the past year. Technical papers were presented by outstanding scientists and engineers in their respective fields. Nobel prize winner in Physics, Professor Kusch presented a paper on "Precision Atomic Beam Techniques."

JAPAN SEES U. S. COLOR TV A million-dollar color television caravan of the Radio Corporation of America is now in Tokyo at an American exhibit in the International Trade Fair. The equipment includes full color TV studio facilities, two camera chains, lighting and testing apparatus, film transmitting facilities and two fully equipped, specially built mobile units. Japan was the first country in Asia to introduce black and white television.

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COMMUNICATIONS -- *Half the Battle!*

Will today's communications help win tomorrow's battles? For a good answer, take a look at how the U. S. Army Signal Corps is keeping ahead of the fast-changing techniques of military operations — by providing *tomorrow's* communications systems *today*.

Look, for example, at the Signal Corps' completely miniaturized, all-transistor carrier system for cable or microwave communication in the field. It is fully portable, takes up less than a cubic foot of space, weighs only 65 pounds (compared to 500 for comparable World War II equipment). It provides 4 separate channels, offers highly reliable operation under severe conditions ranging from Arctic cold to tropic sun.

Lenkurt, selected as prime contractor for the development of this carrier, has facilities uniquely oriented to research, development, and precision production for vital defense projects. As a leading specialist in telecommunications, Lenkurt works directly with government agencies and with other manufacturers in providing equipment either "off-the-shelf" or specially designed, to meet the highest standards and most exacting requirements of the military.

See the Lenkurt exhibit, Booth 51, at the AFCEA show, May 20-22.

Lenkurt ELECTRIC

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SCIENTIFIC EDUCATION . . . . the NEW CHALLENGE

RCA Fellow studying at the New York University College of Engineering is shown verifying transistor equivalent circuits on the University's electronic analogue computer.

By Brig. Gen. David Sarnoff

Chairman of the Board of Directors
Radio Corporation of America

WHEN THE ARMED FORCES COMmunications and Electronics Association was organized in 1946, its main objective was to encourage a firm and lasting partnership between the military and industry. In its eleven years of operation, AFCEA has successfully accomplished that mission, and time has broadened its objectives and extended its opportunities.

As the first president of the AFCEA, I congratulate its members who have built and strengthened the organization with enthusiasm and patriotic devotion.

Today the influence of AFCEA as a vital link between the Armed Forces and industry extends through forty-eight chapters, across the United States and overseas. Its roster of more than 200 professional organizations, corporations and manufacturing divisions contains many of the most distinguished American names in science and engineering.

Through its interest and activities in communications, electronics and photography, the AFCEA has established a timely relationship between the military and industry. It has helped to keep this country in the vanguard of the latest developments in every phase of technology.

David Sarnoff, head of RCA, recently celebrated his 45th anniversary in the radio field. He helped originate the present-day radio receiving set and was mainly responsible for the creation of NBC.

Shortage of Skills

Today a new situation—a crisis in scientific education—has arisen and with it a new opportunity for AFCEA to extend its tradition of service to our national security. The solution to this critical problem may well be the challenge and the dedication of AFCEA in its second decade.

The crux of the matter is that in a period of growing dependence on increasingly complex electronic systems and scientific devices for national defense, this Nation faces a serious shortage of essential scientific skills. There is a decline in the number of students in science and engineering, and there are indications that the downward trend may continue. Unless the situation is quickly reversed, the balance in scientific superiority may ultimately swing away from the free world.

Safety and Strength

Should the day ever come when we yield our scientific and engineering mastery to an enemy, we will have surrendered a key bastion to the fortress of liberty. In the final analysis, our safety and the safety of the free world rests on the deterrent capacity of America's armed might. Strength, however, will deter only so long as it is based on continuing supremacy in all areas of technology. And this supremacy is assured only as long as we have the finest scientific and engineering talents available to our laboratories and industrial plants. (*Continued on page* 50)

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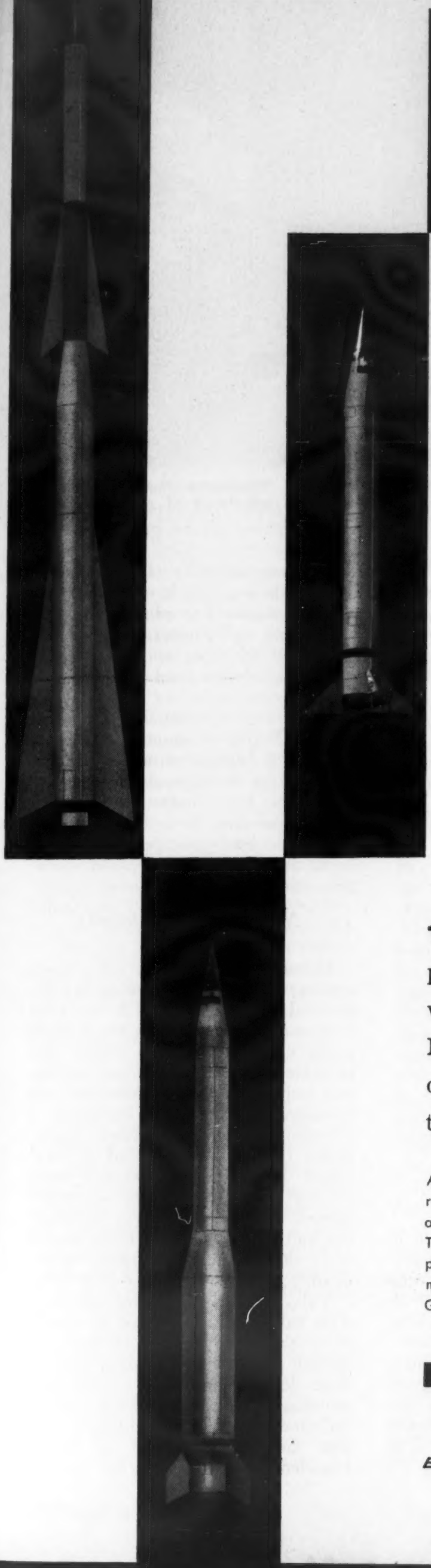

TOP SCORE With a ten-year backlog of experience in pioneering the new age of rockets and guided missiles... and with five major projects currently in work for the U.S. Army, Navy and Air Force... Martin's contribution to design, development and operation in this advanced field of flight is continually expanding.

In 1946, development was commenced on the Martin MATADOR pilotless bomber for the Air Force... GORGON, a Navy test vehicle... and the VIKING series of high-altitude research rockets. Within two years these were followed by ORIOLE, an experimental air-to-air missile, and PLOVER, a target drone. More recent developments include LACROSSE for the Army... TITAN, the Intercontinental Ballistic Missile for the Air Force... and the launching vehicle for project VANGUARD, the earth satellite, undertaken with the Naval Research Laboratory as a major U. S. contribution to the worldwide science program of the forthcoming International Geophysical Year.

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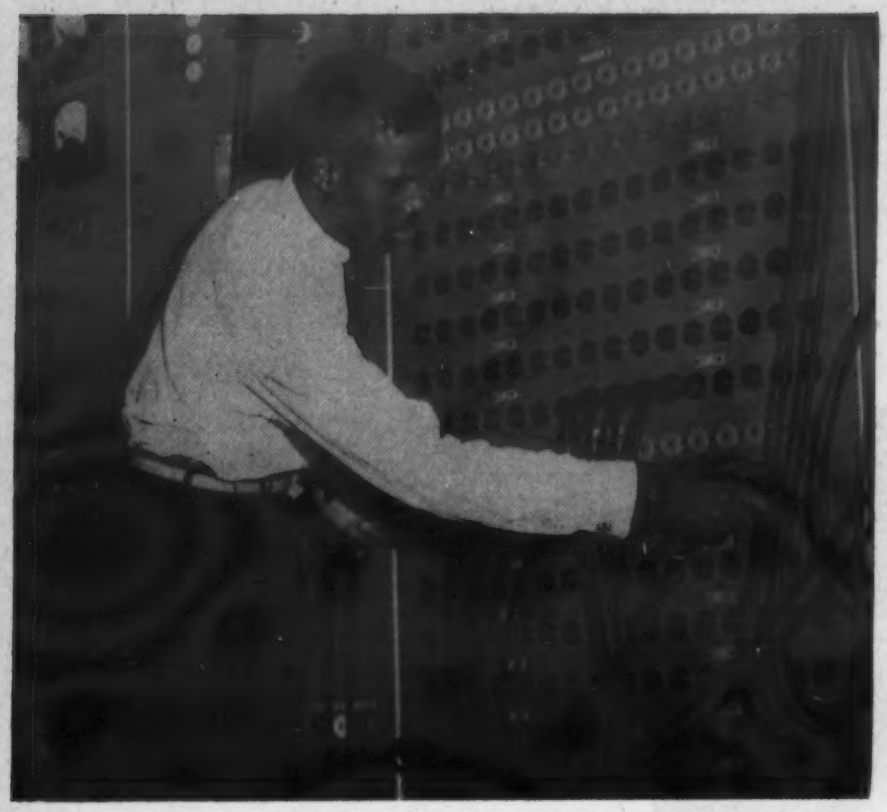

In the electrical engineering laboratory of Howard University, this RCA scholar checks circuits on the distribution panel for an experiment.

RCA scholar at the University of Washington checks a dynamic demonstrator used to demonstrate adjustment of radio receivers.

The crisis caused by the shortage of skilled technical manpower exists on three levels, all of which are directly related. It is painfully apparent in the fields of creative industry. It exists in the colleges and universities, and extends into the high schools. It permeates the teaching of sciences in colleges as well as in secondary school classrooms.

A glance at current advertisements for scientists, engineers and technicians should be sufficient to convince anybody of the shortage of skilled personnel in industry. Competition to entice the existing cadre of technical talent away from one organization to another has reached a new peak of intensity.

Surveys

According to figures prepared by the Department of the Navy, one defense firm, for example, spent $907,560 to gain 59 employees at a net cost per employee gained of $15,328. Another firm spent $100,674 and had a net loss of four employees; a third spent $40,722 and had a net loss of 14 employees. Such methods not only are wasteful; in the final analysis they are self-defeating.

The picture is even more unsatisfactory on the university and college level. Surveys reveal that to fulfill peacetime industrial requirements, the United States needs 35,000 to 50,000 new engineers each year. And we are told that despite increasing dependence on their services, the number of graduates in science and engineering has decreased by 52 percent since 1950.

Today we read that the Soviet Union has approximately 175 modern schools which offer engineering training exclusively to an enrollment of about 300,000 students. Although some 210 colleges in the United States offer engineering courses, their over-all enrollment totals approximately 194,000 students.

As for the secondary schools, the decline in the number of students receiving adequate training in the sciences and mathematics is both marked and urgent.

In addition to the shortage of students in science and engineering, there is, finally, a shortage of teachers. Inadequate pay, absence of incentives, and brighter opportunities in industry have served to siphon off many of those best qualified to carry on the training of new scientific generations. Thus, the picture shows an inadequate harvest for the present, the prospect of diminishing returns for the future and the depletion of the seed grain. It is a situation which calls for prompt and energetic corrective efforts.

Solution

The immediate task is to see to it that young people with the necessary aptitudes in the sciences and technologies are given every chance to develop their talents and enter a career in these fields. This includes provision for adequate instruction. Secondly, we must provide a climate in which youth will be fired by the tremendous challenge which science offers and the broad opportunities it presents.

The responsibility for securing these goals is total. It cannot be assigned exclusively to education, or to government or industry. It must be shared by all three and with equal awareness of the need and the urgency.

Since the membership of the Armed Forces Communications & Electronics Association and its thirty-six chapters throughout the country represents both industry and the Armed Services, it is in a unique position to lend prestige and authority to the drive for increased scientific manpower and teachers.

National Educational Reserve

Through the support of school activities and its participation in educational programs, AFCEA can help to stimulate and increase the flow of youth into the scientific studies and ultimately into research, engineering and industry. The opportunities are as extensive as they are important.

Some time ago, for example, I proposed the establishment of a "National Educational Reserve," comprising qualified teachers in mathematics, physics, chemistry, engineering and related subjects to be drawn from the technological ranks of industry.

This would involve the release—with full pay for at least a year—of a reasonable number of men and women for teaching assignments in their local schools. It could also mobilize those who have reached the retirement age in the military services and in industry, but whose knowledge and experience would

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make them inspiring teachers. Additionally, it could include qualified people willing to volunteer their services to teach in night schools without giving up their industry jobs.

The number of teachers recruited from any single organization would be too small to entail hardship for any one—but the total number comprising the corps could be drawn from such an extensive list of organizations that it would be large enough to give new impetus to teaching of the sciences in our school system, especially at the junior and high school level.

Encouragement From Experienced People

In some degree too, such a plan would amount to the restitution by business of personnel it has siphoned off from the school system. Men and women who normally would have become teachers of the sciences have instead gone into industry where the rewards are more enticing. Because of their practical experience, such people could become even more valuable to education in that they would bring the breath of reality into the schoolroom and restore the sense of adventure to technical careers.

There are other areas in which AFCEA can make a notable contribution to the campaign for skilled technical personnel.

Far too many young people are lost to science for lack of encouragement from experienced elders or through inadequate information about the many opportunities it offers. By the support of such activities as student chapters of AFCEA or through individual student enrollment in chapters already existing, much can be done in this direction by AFCEA to further an interest in the technologies.

Contributions From Industry

There are many members of AFCEA who can provide lecturers or lecture material and stage scientific or technical demonstrations. They may even be able to lend some simple equipment for use in schools. The novelty of an outsider coming to speak, the opportunity to see science at work for progress, the chance to finger equipment in industrial use would help open the classrooms to the living vitality of science and inspire many a young student to take up its challenge.

Industry has shown that it is prepared to contribute generously to the advancement of education. Its donations have run as high as $100 million a year. Yet it has been estimated that the Nation's colleges and universities will require an additional $800 million a year over the coming decade to carry out their training mission. The bulk of this must come from individuals and corporations if the need is to be met without the Federalization of education.

A senior, studying under an RCA Scholarship at Wellesley College, conducts research tests on an infrared spectrometer.

Toward A Long Range Objective

If industry can spend tens of thousands of dollars to attract young men getting out of college, it seems that it might invest even larger sums to get them into college and to help them complete their studies.

Recently, the Radio Corporation of America established thirty college and university scholarships for students who are preparing for the science teaching professions.

It was done because we recognized that the supply of creative scientific and engineering personnel depends upon the quality and number of secondary school teachers who will instruct our young people in such courses as physics, chemistry and mathematics. Through such programs which contribute to the supply of science teachers, we believe that progress can be made toward achieving the long range objective of maintaining America's technological superiority.

The struggle for scientific supremacy in the day of the electron and the atom will not be of limited duration. It is a conflict which may extend over decades, and to retain our Nation's present leadership in technology will call for undeviating tenacity of purpose. In the educational aspect of the conflict, the purpose must be to assure a steady inflow of scientific creativeness into our industrial and military establishments. Since we do not wish to "commandeer" the brainpower of our young people, we must seek out all ways of stimulating their interests and engaging their enthusiasms.

Publicizing Science

We must not neglect a single opportunity or means to inform them of what science is accomplishing and what it means to America's progress and security. We must utilize all means to see that this message reaches them at a time when they are beginning to develop their basic concepts and we must remain with them long after they embark on their careers.

The AFCEA can help to achieve these goals with persuasiveness and authority. This is the challenge and the opportunity. Its importance is matched only by its urgency in the interests of national defense and peace.

International Telephonic Operations

UNITED STATES PHASE OF OPERATION

By

W. G. THOMPSON

ASST. VICE PRESIDENT

AMERICAN TELEPHONE & TELEGRAPH CO.

William G. Thompson, Director of the Overseas Services of the Bell Telephone System, has been responsible for coordinating activities in connection with new underseas telephone systems.

COMMUNICATIONS HISTORY WILL, I believe, mark September 25, 1956, as the beginning of a new era in voice communication between continents. The Transatlantic Cable system, which was opened for public service on that date, has demonstrated that peoples separated by ocean barriers can talk with one another as naturally, as clearly, and as conveniently as neighbors do in a local telephone conversation.

Although this new cable has been in service only a little over five months at this writing, the stimulus to telephone traffic between the United Kingdom and this country exceeds the most optimistic forecasts. The increase in daily telephone messages over the pre-cable level of messages averages over 75 per cent. On Sundays, the increase averages approximately 65 per cent. The volume of messages on Christmas Day 1956 was 1200, compared with 450, the highest previous Christmas volume which was reached in 1953.

Several of the cable circuits were extended through England to the European continent. One channel was terminated in each of five European countries and two in another. Even with these few cable circuits available, overall service between the United States and these countries has increased substantially, being up 20 per cent. Naturally, this development has led to a desire by the countries concerned for more cable circuits.

Although the increase in the transatlantic volume is greater than anticipated, it is not surprising when one reflects upon the progress of long distance telephony within the United States. It has been demonstrated over the years that as the Nation progresses, its need—commercially, industrially, and socially—for more extensive and better long distance communications grows likewise. The present vast, national network of long distance telephone lines and the continually increasing use of long distance by the public are substantial proof of the impact of communications on the economic and social relationships of the United States.

Despite the differences in time, customs, and often in language between the countries of the "Neighborhood of Nations," it appears that the potential basic requirements for communication of one country with another follow our domestic pattern. The world of today, with its strains and stresses and with the interdependence of its people upon one another, needs clear and speedy communications more than ever before. For example, the social value of the new transatlantic cable was demonstrated by the recent tremendous surge in Christmas calls, previously mentioned.

It is well-nigh impossible to calculate or analyze the impact of the new international telephone facility on our Nation's economy as a whole. Users of transatlantic telephone service come from a cross-section of American industry. Particularly ac-

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tive, of course, are organizations and persons engaged in foreign commerce. They range from large companies devoted to oil and shipping operations to individuals, such as diamond buyers, fur merchants, foreign exchange dealers and lawyers. Emergencies, like the Suez situation, undoubtedly create new and important users of the telephone service for businesses and for governments. In the latter connection, our experience has been that such uses, stimulated by specific events, continue after the crisis has passed.

In summary, I believe there is a substantial, undeveloped potential of telephone messages between the United States and other nations, and that as clear, fast, and reliable service is provided by the installation of adequate facilities along the major world routes, the public will respond with continuing increased usage.

CANADIAN PHASE OF OPERATION

By

D. F. BOWIE

PRESIDENT

CANADIAN OVERSEAS TELECOMMUNICATIONS CORP.

Douglas F. Bowie has been a pioneer in the communications field and has been responsible for organizing the Canadian operational phase of the Transatlantic Cable.

THE MOST ILLUSTRATIVE COMMENT that can be offered to describe the importance to Canada of the new Transatlantic Telephone Cable is that overnight we experienced an increase of almost 500% in transatlantic telephoning and the new level has been maintained ever since. Obviously, we had filled a long-felt want and public, business and official reaction has been overwhelming.

It is our feeling that in thus providing, in collaboration with our British and American friends, high quality service on this route, we have achieved the goal of every communications enterprise, namely, that of giving the customer the latest and best in telecommunications facilities, which he is entitled to expect in return for his money. The response of Canadians, as indicated above, certainly seems to prove the correctness of that theory and the 1956 project was, as a result, an outstanding success. It is a continuing obligation for us to look to the future and to utilize all technological improvements and developments so that the industry can keep apace with the ever increasing public demand for ample and economic means of communication during a rapidly expanding economy.

It is our view that the planning and laying of this Transatlantic Telephone Cable was an outstanding example of international co-operation. Major undertakings—such as this was—frequently fall behind schedule. When there are several partners, the questions of rights and privileges may perhaps tend to slow up general progress but when sovereign rights, pride of craft and such other intangibles are also thrown into the pot, the results could be serious. The Transatlantic Telephone Cable project encountered those problems and overcame them. It was completed and in use almost three months ahead of the original target date. The unanimity of purpose of all concerned brought about that satisfactory result and it was an outstanding demonstration of what our three countries can do when determination to get the job done is the overriding factor.

This development is, I am confident, only the forerunner of greater things to come which will provide more and more means of communication and, I believe, ultimately at reduced cost to the user so that he will be provided with every facility for correspondence in the broadest sense —whether by the spoken or by the written word. The first Transatlantic Telephone Cable, and those which will surely follow, can only help to produce improvement in cultural and commercial relationships between the countries they serve, and the greater development of ample direct communications between nations must surely, in the long run, produce greater understanding b e t w e e n people. From the point of view of security, there can be no doubt that the continuity and secrecy of cable operations will be important factors contributing to the defence of the free nations of the world.

It is our belief that in providing such high quality service on the Transatlantic Telephone Cable, we jointly achieved the goal of every communications enterprise, namely, that of truly serving the public by the provision of the best possible facilities at the lowest possible cost. That happened in 1956. Now we must look ahead and provide for the years to come.

Pictured here is the Telegraph Test position of the Transatlantic Telephone Cable.

As we go to press, we learn that officials of the governments of Canada and the United Kingdom, together with representatives of Cable and Wireless, Ltd., and Canadian Overseas Telecommunications Corporation, met in Ottawa recently to consider arrangements for the development of a new transatlantic sixty channel cable for telephone and telex services across the Atlantic.

Pictured on the left is the International Exchange in London where all North American Telephone Cable Services are performed. Since the beginning of this service, total paid minutes have increased by 125 per cent.

Below: The author, Sir Gordon, as Deputy Director General had technical responsibility for Britain's contribution to the transatlantic cable. Together with Dr. M. J. Kelly, he received the international Christopher Columbus prize for his work on the cable in 1955.

UNITED KINGDOM PHASE OF OPERATION

By

Sir GORDON RADLEY

THE DIRECTOR GENERAL, GENERAL POST OFFICE
UNITED KINGDOM

By the beginning of February 1957, the transatlantic telephone cable had been in service for some 30,000 hours. Through service between London and New York and Montreal was interrupted for a few hours in January, but that was due to a fault in one of the unattended radio-relay stations in Nova Scotia. It was quickly cleared by an engineer who arrived at the snow surrounded station in a helicopter.

The 400 electron tubes and 7000 other electronic components which operate in the submerged repeaters on the bed of the Atlantic between Newfoundland and Scotland and between Newfoundland and Nova Scotia have so far given no cause for concern. Nor have the transmission characteristics of the submarine cable system changed to any serious extent. That, I suggest, is an important measure of the technical success of the cable. But the ultimate measure is the way the public, especially the business public, is making use of it. The records show that calls between Great Britain and the United States have risen by about 80 per cent, and are now running at about 4,000 a week. Calls between London and Montreal have risen even more, by 150 per cent over the daily average—about 500—before the cable was opened on September 28th. Further, the total paid minutes increased by 125 per cent, while the average paid duration of calls had also increased considerably.

British listeners to broadcasts from America, as well as those using the telephone service, are experiencing the incomparable increase in clarity since they began to come over the new cables, and we can now hear such broadcasters as Alistair Cooke as clearly as if he were speaking in one of the B.B.C. studios. The Cable was also used very successfully on January 24th for a joint meeting between three professional engineering Institutions—The Institution of Electrical Engineers in London, the American Institute of Electrical Engineers in New York and the Engineering Institute of Canada in Montreal. Public address systems in the three halls linked together by the cable enabled engineers in the three cities to join together in a discussion of technical papers.

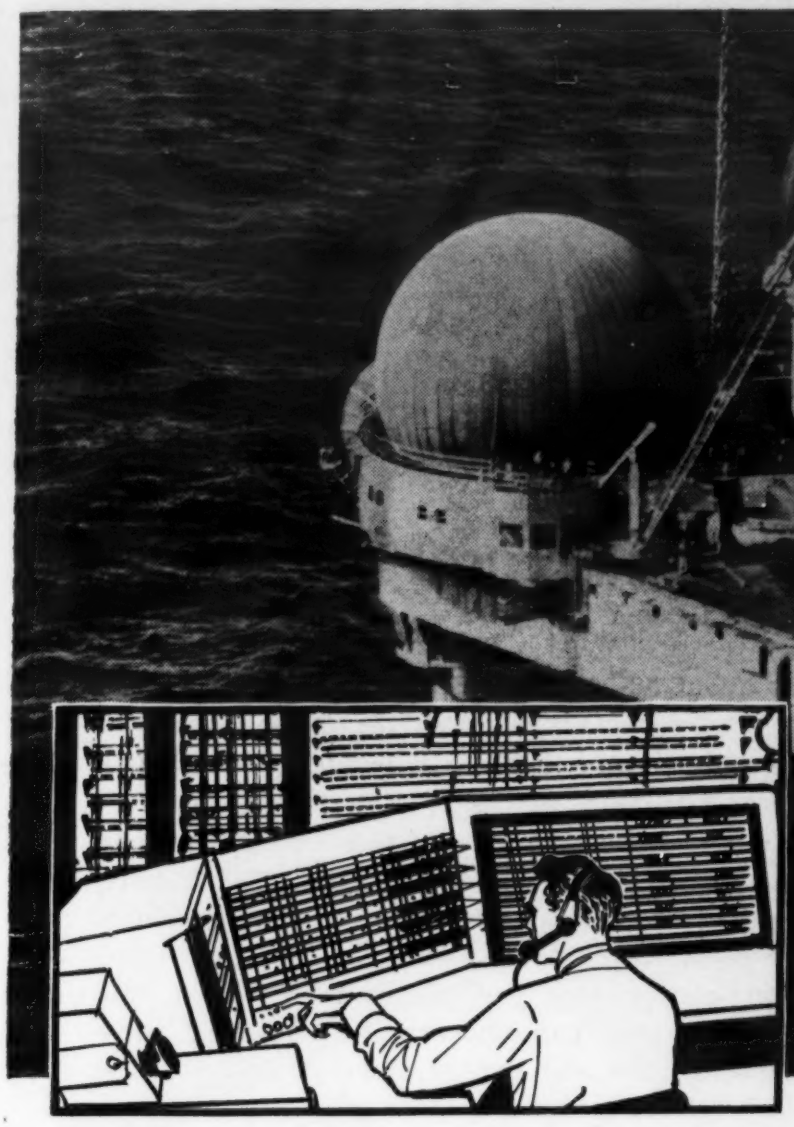
The cable is also carrying leased services and customer-to-customer services with Canada; the latter, known in Britain as "Telex", have increased considerably and we are expecting a heavy traffic build-up.

Readers of SIGNAL will naturally be interested most in the cable's contribution to the maintenance, by close contact, of the Western Alliance. This is largely a governmental matter and, although much of the communication is secret, it can be said that the telephone cable has added greatly to the stability and security of Government exchanges.

We in Britain are proud to know that most of the cable was made in our country and that it was laid by Her Majesty's Telegraph Ship *Monarch*. But the project was only possible because we made use of technical developments from both sides of the Atlantic, in particular, the flexible repeater housing from the Bell Telephone Laboratories. Throughout, our American and Canadian friends worked in the closest intimacy with us, freely exchanging all ideas and collaborating down to every detail.

We share your view that the new cable service, one of the finest examples of peace-time co-operation between nations, is the forerunner of great developments in the telecommunications world. Only three years ago it was little more than a dream; today, thanks to Anglo-American-Canadian co-operation, it is a living reality.

Help test SAGE
– the new Air Defense System



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Mr. W. M. Gesell, Room 902, Defense Projects Division, Western Electric Company, 220 Church Street, New York 13, New York or Telephone Collect to: WOrth 4-5400 Ext. 6628.

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E. H. RIETZKE, President CREI
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• *One of a series of institutional messages.*

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CREI Technical Courses Now Mold Desirable Job Attitudes as Well

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*(An actual statement taken from the examination paper of a CREI student—a man with 12 years of professional experience in electronics)**

"When I first started this course, I thought to myself: Why everyone knows these things. After the first chapter or so, I decided that maybe there was really something here that I could use. So I stepped back and took a look at myself. What I saw I didn't like too well. I then went back and started reading again from the beginning. As I went, I checked all of the guide points and the 'do's and don'ts.' It surprised me to find out that upon being truthful with myself, I came out about 50-50. I have made a list of things I have to watch out for and the traits I want to improve or get rid of completely. This list I intend to follow and do my best to improve.

"I wish to say at this time that this is the first time in a good number of years that I have found a course in leadership which was written for people like me who really do need the help; most courses are just a bunch of ideas; this course anyone can understand. I think I have learned much and hope I can put into practice what I have learned."

**Name on file*

We believe the words of this student best describe to you our new training program. In teaching *Leadership,* and getting men to THINK, CREI is supplying that *extra plus* that makes a man more than a good technical man. CREI graduates will have the ability and concept to think above and be interested beyond a particular job assignment. For detailed information about this, or any other phase of CREI's Home Study or Residence program, and how it can help with your technical manpower or training problems, please write directly to: E. H. Rietzke, President.

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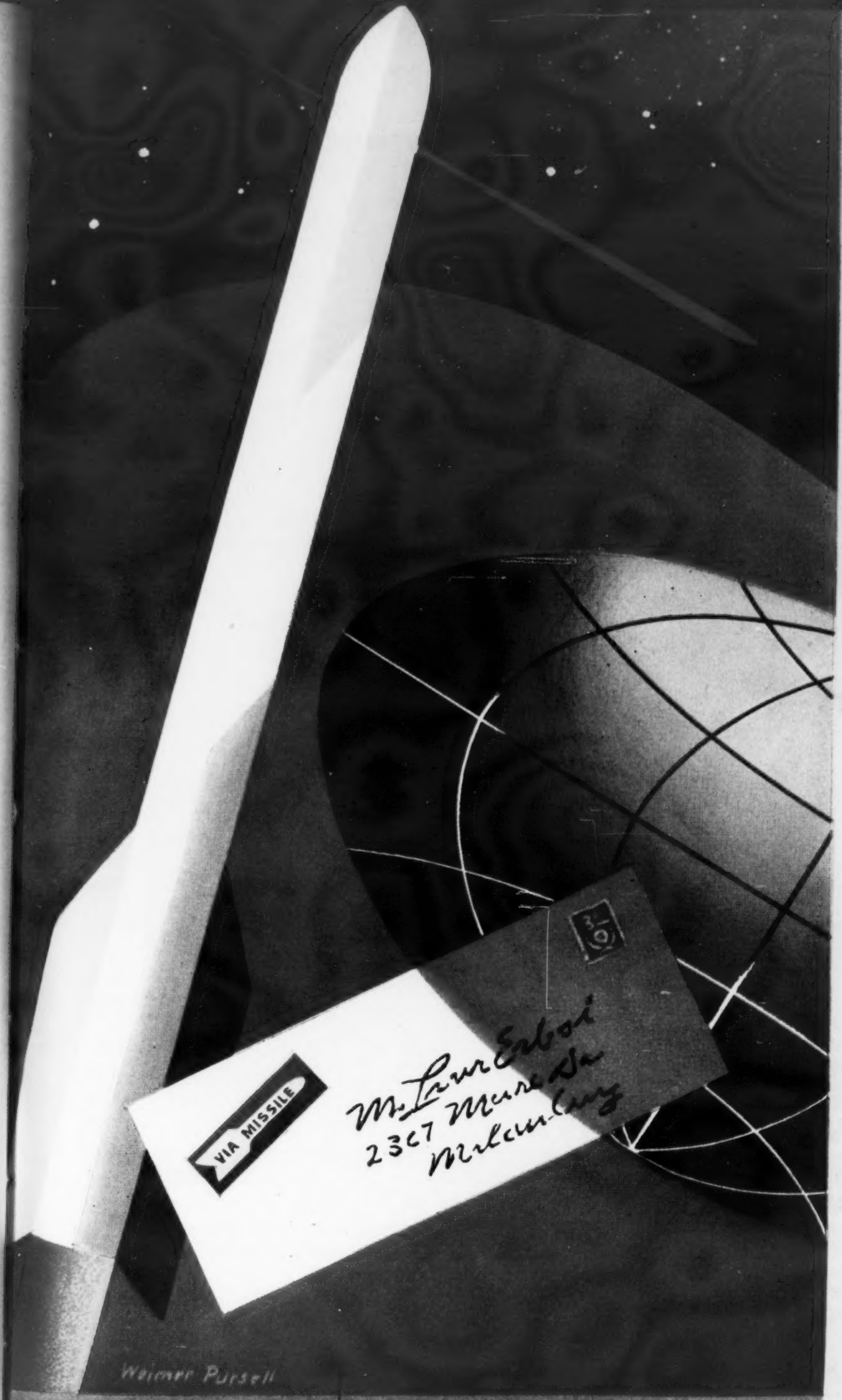

Will today's defense dollars buy you "mail-by-missile" tomorrow?

A relentless scientific quest is underway today in the secrecy of America's laboratories and proving grounds. The object: to enable missiles to safely "reenter" the earth's atmosphere before searing supersonic heats reduce them to dust. The problem is doubly important—while missiles serve America's defense today, their real future might well be to serve man peacefully—as super-fast mail carriers, for instance, that span continents and circle the globe in minutes.

The impetus of military research programs has generated important progress in this quest. Recent Avco research achievements—in thermodynamics, metallurgy, advanced electronics and inertial guidance, in all the sciences that figure prominently in "re-entry"—create hope for a prompt, decisive solution.

Through such experiments as these, America stands to gain over and over again from its investment in defense. For as science forges defense strength, it lays the groundwork for a nation prosperous in peace.

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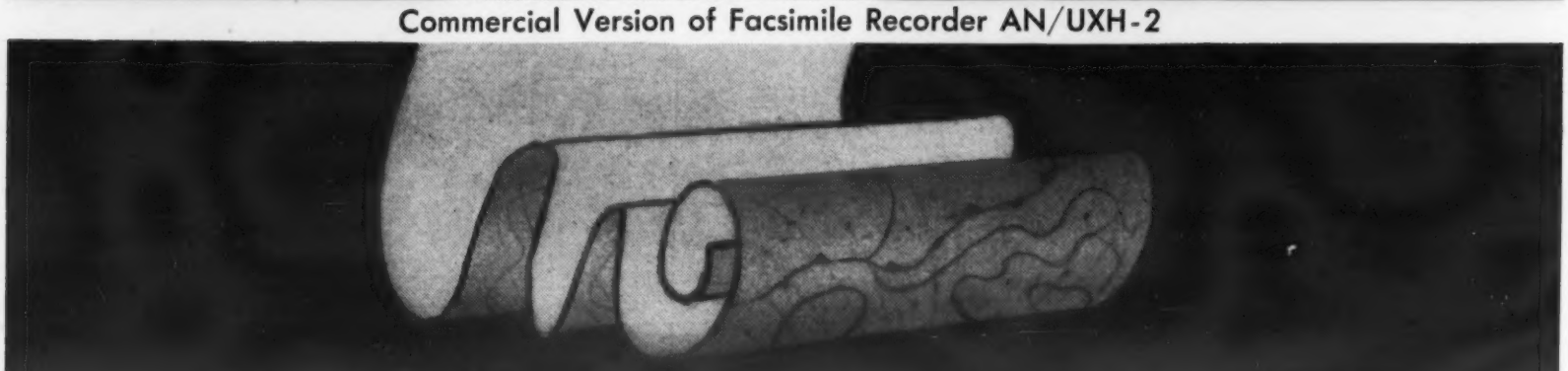

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THE AIR FORCE C-E PROGRAM PROGRESS and CHALLENGE

During World War II, Gen. Pachynski served as Signal Officer, 5th Air Force, Southwest Pacific, and as Air Communications Officer, Far East Forces. He was named Director of Communications-Electronics for the U.S. Air Force in June, 1956.

By Maj. Gen. Alvin L. Pachynski, USAF
DIRECTOR OF COMMUNICATIONS-ELECTRONICS, USAF

THE AFCEA CONVENTION theme this year is "Marconi to Mars" which implies the astounding progress that has been made in the communications-electronics field within the last half century. In this era science, industry and the Armed Forces have marched together to achieve, in the light of yesterday's technological capabilities, what would have been considered near miracles in translating ideas into realities.

No small part of the significant advances made have, since World War II, been applied to meeting the requirements of the Air Force. Our needs for communications-electronics equipment in the Air Force have been expanding tremendously within the last few years.

Equipment Expenditures

The size of appropriations is a pretty good index of this growth. Back in Fiscal Year 1952, the Air Force budget provided approximately $150 million for communications-electronics equipment. A portion of this bought us equipment for installation in aircraft but the bulk of this total covered procurement of equipment required for the Air Force communications-electronics ground environment. In Fiscal Year 1957 funds appropriated for procurement of ground equipment alone totaled in excess of $450 million. Thus, within a span of five years, our rate of expenditures for procurement of ground communications-electronics equipment alone increased more than threefold. The communications-electronics equipment procured and installed as integral parts of our air weapons systems represents, as you know, a sizable additional cost. Much of this airborne equipment operates within the systems comprising the overall communications-electronics environment of the Air Force.

Additional Costs

The dollar figures I have quoted buy us only the equipment called for by the time-phased requirements of our communications-electronics program. To put this equipment into operation, we must at the same time program funds to cover other capital costs such as construction of buildings and other structures and for installation, maintenance and operation of the equipment once it is delivered. As we increase dollar-wise the scope of our equipment procurement costs in these other areas also increase. Thus each successive year sees our communications-electronics program absorbing an increasing share of the over-all Air Force budget. Briefly, why is this so?

Yesterday and Today

Looking back at the past, it wasn't so long ago when a combat aircraft was quite capable of discharging its mission, once airborne, without further communication with, or direction or control from the ground. In World War I, air combat, such as it was, took place without benefit of any such ties. World War II saw the beginning of a significant change. But during that time and for some years afterwards, the measure of Air Force effectiveness remained primarily the number of modern aircraft in the inventory and the personnel necessary to operate and maintain them. The communications-electronics equipment and systems provided to support the Air Force served as an adjunct, an assist, if you will, to our air combat forces.

The coming of the jet and missile age and the introduction of nuclear weapons changed all this. Today we are dealing with air weapons moving at the speed of sound and tomorrow these will operate at velocities unheard of a few years ago. Concurrently, the effective employment of our air weapons in combat is geared to the use of nuclear armament which must find its targets.

SAGE

The qualitative performance capabilities of today's weapons generate demands for communications-electronics means of command, warning, control and direction of unprecedented scope and complexity. These demands increase inversely as the rate at which the gap, in terms of time, between action and reaction in air warfare continues to close. The practical effect of this trend is that today Air Force effectiveness must be measured both in terms of the quantity and quality of the air weapons in our inventory and the communications-electronics environment required to operate our air weapons effectively in combat. The sum total of these represents the measure of our air power.

Let me cite a few examples. I have already referred to World War II. At that time and for a number of years afterwards, our air defense was designed to cope with aircraft moving toward their targets at speeds of less than three hundred miles an hour.

Under such conditions our ground radar stations could operate effectively in the dual role of early warning stations and ground control intercept centers. Manual methods of handling data and control of our intercept aircraft by voice communications were quite adequate for the purpose. As speeds of aircraft increased it became apparent that the target hand-over problem between control centers and the manual transmission and processing of data associated therewith were too slow and cumbersome to permit effective intercept of enemy aircraft. To correct these deficiencies the Air Force adopted the concept of the semi-automatic ground environment or SAGE which primarily fills two specific needs. The first of these solves the hand-over problem generated by higher speed aircraft flying too rapidly through the control area of each radar station. The SAGE concept groups a number of such radar stations together into one area. Each such area has a single intercept control center into which data from the radar stations is fed automatically rather than manually. The second need filled by SAGE solves the command and control problem. This requires rapid assimilation of, and action on, the mass of data flowing into the centralized control center. The SAGE digital computer is designed for this purpose. As most of you know, SAGE is now in the process of implementation. We estimate the capital investment for SAGE may total in excess of $1.5 billion and the annual operating maintenance cost will approximate $400 million annually. This does not include the cost of radar stations feeding data into the system.

The DEW Line

The threat of air weapons operating at supersonic speeds and equipped with atomic and nuclear explosives has made it necessary—for effective reaction by our forces — to push our air attack warning zones further away from vital target areas. The DEW Line, which was described to you earlier this year (January issue of SIGNAL), is such a warning zone. This project represents a capital investment, in terms of equipment and construction, in excess of $400 million dollars. To maintain and operate it will cost the Air Force annually an estimated twenty per cent of this amount.

These two projects alone account for a significant share of funds being applied to the growing Air Force communications-electronics program. Rapid advances in weapon capabilities also have an impact on other functional areas. With air weapon operating ceilings pushing higher and higher, we must keep in step by providing our air defense radars with an equivalent capability to detect enemy targets and control our own weapons. The speed and ceiling performance factors of new weapons also generate requirements for improved air navigation and air traffic control radars.

Strategic Air Command

Our Strategic Air Command operations, based on constantly advancing air weapon capabilities, generate requirements for improved and new communications-electronics systems needed for quick reaction, split second control and effective operation of our retaliatory forces. Continuing air weapon modernization of our Tactical Air Forces likewise results in similar program demands that must be satisfied.

Technological Milestones

Our Air Force communications program is designed to meet all of these requirements. Obviously, the emphasis today is on the application of funds to increasing costs in the Air Defense area where the greatest demands exist for equipment and systems to meet a variety of pressing operational needs. The DEW Line and SAGE projects are outstanding examples of major costs in this area.

Based on recognized operational needs to which our Air Force communications-electronics program is geared, we can expect that the requirements of this program in terms of capital investment, operation and maintenance in the next few years will continue to absorb an increasing share of the Air Force budget.

The maintenance of effective air power requires that we continue to press forward in the communications-electronics area as rapidly as we can to achieve our programmed objectives. Teamed with the scientific and technological competence of the Nation, we have made and continue to make significant forward strides in translating our Air Force program into reality. The development of the digital computer for SAGE and its application to our air defense system is an example. Another is the DEW Line. Still another is the widespread installation and operation by the Air Force of both tropospheric and ionospheric scatter circuitry through and within the Arctic regions. These represent real technological milestones in our march forward to achieve the kind of operational capability the Air Force requires. But in the long-range view there are areas which bear examination from the standpoint of current state-of-the-art capabilities as set against future requirements.

Radar

Let's consider several examples. The modern radar, operating on the principle of a reflected pulse, utilizes basically the same technique invented in the 1930's and used with such telling effectiveness in the Battle of Britain early in World War II. True, today's radar, used for air defense and traffic control has been vastly improved and refined. It will, with further known state-of-the-art improvements, continue to do an effective job for us in the future. But in order to cope with tomorrow's targets we continue to increase its power. By doing so we further emphasize one of the inherent limitations of radar, the line of sight characteristic, which keeps us from seeing targets below the horizon. Thus, in order to maintain the lower altitude coverage required for effective air defense in a given area, we must maintain substantially the same density of radars regardless of the addition of higher powered radars to the inventory. As this trend continues into the future, complexity and costs will necessarily increase correspondingly.

Scatter Techniques

I have mentioned the application of forward scatter techniques to fulfill Air Force operational requirements. These represent significant advances in the state-of-the-art of communications. But these scatter propagation techniques are still used for transmission of signals which have remained virtually unchanged since the telephone, the teletypewriter and the facsimile device were invented. The tempo of today's air operations is generating requirements for ever increasing capacity, speed, versatility and reliability in communications. To satisfy the requirements for greater capacity, speed and versatility, we must multiply the number and types of channels operated over a given radio circuit.

The scatter techniques we have adopted provide us with the means for maintaining continuity in our point-to-point communications despite

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adverse propagation conditions and they are a significant improvement over the high frequency mode of radio communications with respect to accidental or deliberate interference. However, this problem is not completely solved. We are searching for a technique that will guarantee positive communications between ground and air, particularly at distances beyond the line of sight. Much effort is being applied toward developing more rapid and reliable means of communications. But for the most part the state-of-the-art advances being accomplished will, as in the case of radar, move us forward technologically in relatively small steps whereas our requirements for the future appear to call for seven league boots.

Rapid Advances

The types of problems just described, with which we are coping in Air Force communications-electronics today, have been generated by the rapid qualitative advances made in our air weapons. These advances are direct results of a significant technological breakthrough in each of two fields of science. One is the mastering of aeronautical science of the problems of flight at supersonic speeds. The other is the development of a hydrogen bomb following hard on the heels of our success in producing the atomic bomb. The outstanding successes in these two fields were considered, not so long ago, as unattainable. That they were achieved is a great credit to our Nation's research facilities and technology.

The Challenge

It is my view—first, that a major technological breakthrough in communications-electronics equivalent to those achieved in the nuclear and aeronautical fields, is required if we are to solve, in this area, the real problems of the foreseeable future; and — second, that this Nation has amassed enough scientific and technological competence to effect dramatic solutions to these problems. The requirements for such a breakthrough constitutes a real challenge to all of us. Our survival in the world of today can be attributed to the ingenuity and energy with which we have effectively solved yesterday's problems. Our future could very well depend upon how effectively we can apply these national attributes to the challenge which confronts us.

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A senior Engineering Assistant of Western Union's Radio Transmission Division adjusts large "forward scatter" microwave antenna atop the telegraph company's building in New York City. The antenna is used for beyond-line-of-sight tropospheric radio signal propagation tests between New York and Philadelphia.

Western Union Expands with Microwave

by Walter P. Marshall PRESIDENT
WESTERN UNION TELEGRAPH CO.

WESTERN UNION PLANS TO MAKE increasing use of microwave radio to keep pace with national defense requirements and to provide added common carrier facilities in the private wire, facsimile, data processing and television fields. Our expansion comprehends a nationwide network of microwave facilities that will link important cities and defense areas. It is expected that 90 percent of the added facilities to be derived from beam extensions now under way will be used for governmental and industrial private wire systems.

Walter P. Marshall is also a director and member of the executive committees of American Broadcasting-Paramount Theatres, Inc. and of the American Express Co., with wide experience in communications.

The leasing of "closed-circuit" telegraph systems for the fast, economical handling of volume communications has doubled in volume in the past five years and is increasing at a rapid rate. We have been meeting this demand through increased use of carrier equipment which creates a multiplicity of message circuits on a single pair of wires or radio beam. Carrier equipment now provides more than 2,750,000 miles, or over two-thirds of the four million telegraph channel miles, we use for message and private wire services.

New Circuits

We expect to complete extensions of Western Union's microwave beam system to Cincinnati and Chicago by the end of the year, which will provide 1000 new duplex circuits in the heavily industrialized midwest area for general telegraph service and for leasing to industry and government. These extensions cover 556 airline miles and will flash through 20 towers in four states. Tower sites are being acquired for an additional westward route in excess of 1,000 miles which will reach from Indianapolis to Kansas City via St. Louis and from Cleveland to Chicago via Toledo and Detroit, and extensions to other key areas of the country to provide nationwide coverage are planned. National defense is, of course, an important consideration in our extensions and selection of tower sites so that main cities may be by-passed in the event of a national emergency.

Surveys

In planning our present microwave extension it was found that topographical maps were lacking in certain areas and others were outdated or without essential detail, such as the location of high trees, high buildings and other man-made obstructions that might interfere with line-of-sight signal transmission. This problem was met by making aerial surveys of the new route at a time when the weather was clear, the

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ground free of snow and trees bare of foliage.

The aerial mapping was done by planes flying at 35,000 feet, and 350 photos were made of a five-mile-wide path, which provided our engineers with a complete, up-to-date picture of the terrain. As a result of this accurate survey it was possible to eliminate several stations from the original plan with substantial savings in construction, equipment, and annual operating and maintenance costs.

Self-supporting towers of simplified design using "fly-swatter" reflectors are being installed in the new system. These reflectors catch the beam and direct it to receiving equipment at the bottom of the tower where the signal is amplified and angled upward to another reflector and on to the next station.

Monitoring System

A unique monitoring system developed by Western Union technicians automatically places an alternate beam circuit in operation when the regular circuit fails so that there is no service interruption. At the same time, a Western Union facsimile machine automatically records the nature and exact location of the failure.

Under our monitoring plan, each relay station is assigned an identifying code signal which registers on a master facsimile recorder at the terminal. Other code signals will show, for example, that the trouble is caused by a weak signal, that there is emergency generator operation because of commercial power failure, that tower warning lights are not on, or even that an unauthorized person is on the premises. When a fault occurs, the station affected sounds an alarm bell at the nearest monitoring center. The station then identifies itself and makes a report of its particular difficulty for which it will receive prompt maintenance attention.

Improvements

Microwave transmission techniques are undergoing constant changes and improvements as the result of engineering research and development. For example, changes in air density, movements of warm and cold weather fronts and other meteorological factors cause radio signals to bend and fade. Such conditions occur most frequently in summer months, particularly at night and during early morning hours. To help overcome this problem, Western Union engineers experimented with an increase in radio transmission power above the one-tenth watt originally used.

New Tube

The Sperry Gyroscope Company, developer of the Klystron tube, was asked to build a tube of greater power to meet Western Union's needs. The result was a new Klystron tube with a power of 10 watts, 100 times greater than the tube formerly in use.

An initial five-month transmission test of the new tube resulted in perfect operation while another radio beam channel, using the old tube with one-tenth watt power, suffered 17 interruptions from atmospheric disturbances totaling 23 hours during the five months. The new tube has reduced the effect of atmospheric difficulties in radio beam transmission outages to a remarkable degree and is now in use throughout Western Union's beam system.

A Radio Relay First

Western Union played a pioneering role in the application of microwave radio for telegraph transmission. During World War II, thousands of scientists worked on the perfection of radar and microwave techniques including wave guides, cavities, and development of new tubes, such as the resonant cavity magnetron and the Klystron. Contributory effort in allied fields gave added impetus to the growth and advancement of a new communications art—microwave radio.

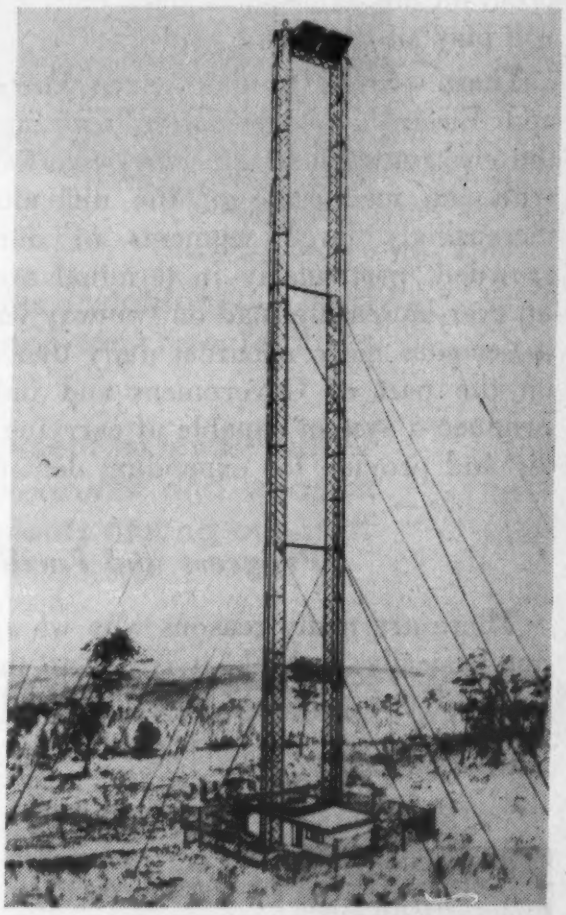
Recognizing the practicability and desirability of applying super-high-frequency radio to telegraph transmission, Western Union in August, 1944, applied to the Federal Communications Commission for a construction permit to build an experimental radio relay system connecting New York and Philadelphia. The New York-Philadelphia system was placed in operation in March, 1945, and began carrying commercial traffic in October, 1946. This was the first commercial use of microwave and also was the first use made of it for telegraphic transmission.

Experiments

Our research engineers have been experimenting with new "forward scatter" microwave transmission techniques and rapid advances are being made with this revolutionary method of operation. Tests indicate that it is now possible to beam ultra-high frequency radio waves into the troposphere, where they are "reflected" to distances as great as 200 miles and even farther. This development offers considerable promise for some types of radio beam extensions, especially where difficult terrain is a factor, since great distances can be covered with fewer relay towers.

A Microwave Future

Microwave radio has demonstrated its ability to carry telegraph, voice, facsimile and television signals fast and efficiently. Beam facilities are particularly suited for broadband transmission systems where many channels are required and have additional advantages over wire circuits. They are not subject to interruptions from wind storms, sleet, snow, ice, lightning, power induction and earth currents. As a new, challenging and rapidly expanding medium of communications, microwave is destined to play an increasingly important role in the future growth and expansion of the telegraph industry, and in strengthening our national defense.



Pictured above is a drawing of Western Union's new self-supporting microwave tower with "fly swatter" reflectors. A reflector catches the beam and directs it to receiving equipment at the bottom where the signal is amplified and angled upward to another reflector which flashes it on to the next station. This is the tower now being installed on W.U.'s microwave beam system extension to Cincinnati and Chicago.

Application of Electronics to National Air Traffic Control

By the Honorable Edward P. Curtis

Special Assistant to the President of the United States for Aviation Facilities Planning

IT IS ESSENTIAL THAT THE NATIONAL AVIATION facilities System, that is required to provide the smooth and healthy growth of aviation, has a continuing program of modernization. Whatever future system and development program that is decided upon, electronics in all its phases will play an important part.

Those of you in the Armed Forces Communications and Electronics Association concentrating on work in the electronics field are more familiar than most people with the magnitude of the difficulties that exist. As increasingly large segments of our airspace become crowded, particularly in terminal areas, and as we put an ever-increasing load on two-way voice communication, it becomes more apparent daily that only a major effort on the part of Government and industry together can produce a system capable of carrying today's load in the air and provide for expanding demands in the future.

Progress and Facilities

There are many reasons why we are in trouble today, but basically, I think, it is due to the fantastic development of our aviation, both civil and military, in recent years. All of us can well remember when a hundred miles on a motor was about the best you could expect. Our airspace was relatively uninhabited and our pilots were certainly uninhibited by regulations and controls. In the space of a few short years, all this has changed. Now we measure top speeds in Mach numbers instead of miles per hour and passenger miles flown in the tens of billions. Increasingly large portions of our airspace are becoming crowded and our traffic control system and airport facilities are becoming growing bottlenecks. For the first time in aviation history our forward progress is being threatened, not by the capabilities of our aircraft or the demands for their use, but by our own failure to provide adequate facilities to handle them.

Improvements

Following the excellent report of the Harding Committee which highlighted some of the important deficiencies existing today, the Administration took vigorous action to look for both short- and long-term measures to improve the situation. One of the immediate results has been the very large increase in Civil Aeronautics Administration's budgets for purchase and installation of equipment and additional personnel to operate the Federal Airways System. Their program will result in a real improvement in our traffic control and communications set-up during the next two or three years. The program deserves, and I sincerely hope will get, the support of the Congress as well as of the Executive branch of our Government. With perhaps some additions and amendments, it represents the most effective action we can take for the immediate future.

In considering the longer term problem, the President has charged me with three major areas of responsibility.

(Continued on page 66)

The Author

Edward P. Curtis has been with Eastman Kodak since 1920 and is now Vice President in charge of motion picture film business throughout the world and supervisor of general business abroad. During World War II, he served as Chief of Staff of the U.S. Strategic Air Force in Europe and attained the rank of Major General.

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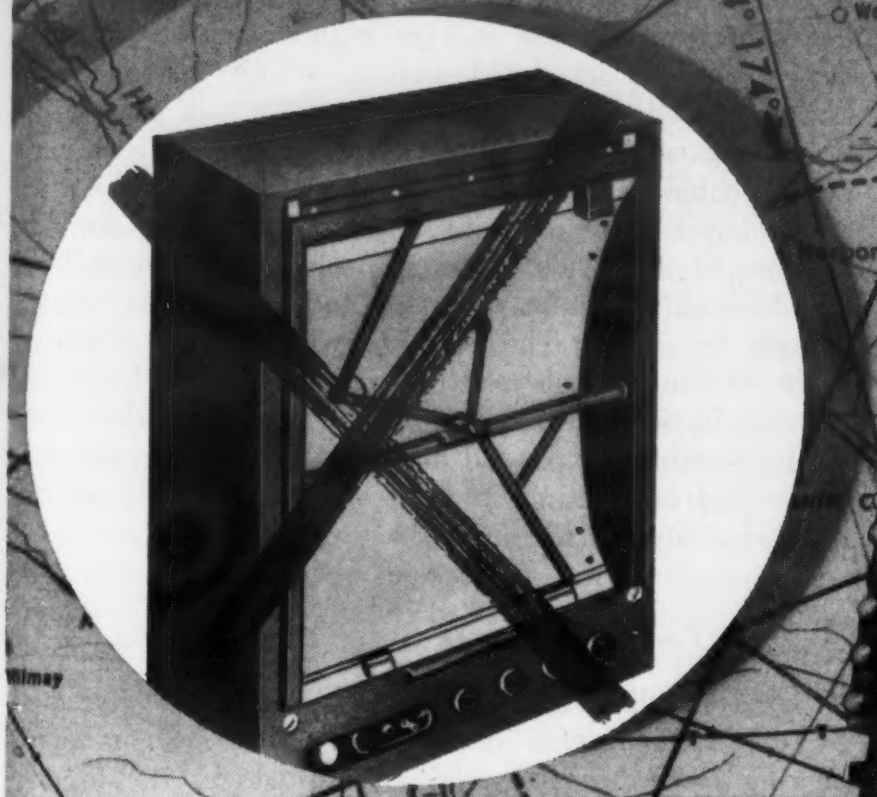

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First is the direction of a study of the Nation's long-range requirements for aviation facilities including airways, navigational aids, communications and airports; second, the development of a comprehensive plan to meet these requirements and finally, to recommend such organizational, legislative, and budgetary procedures as may be necessary to implement the plan.

Long-Range Requirements

Our studies into the long-range requirements include the numbers of aircraft and the types which are likely to be in the system in the next twenty years. In terms of numbers, we expect that the scheduled air carrier figure of approximately 1,500 aircraft will increase very little if any during this period, but of course, larger and faster planes will generate a large increase in take-offs, landings and in passenger miles flown. Similarly, the numbers of manned military aircraft will show some slight increase in the near future and then begin to decrease as missiles are introduced into the tactical picture. It is in the field of general aviation, including everything outside of the airlines and the military, where we would expect the greatest increase to take place—something in the order of fifty percent from approximately 60,000 active aircraft in the inventory today to about 90,000 in 1975. So far as aircraft types are concerned, the period up to 1975 will be characterized by the completion of the transition to turbine driven aircraft in the military and likewise the conversion of perhaps 90 percent of the air carrier fleet to either turboprop or pure jet types. We would expect that even by 1975 the great bulk of the general aviation fleet will continue to be piston driven with perhaps 10 to 15 percent, represented by the executive type planes, to be turbine powered.

Major Traffic Areas Sampled

In considering the requirements for aviation facilities in terms of traffic control, communications and airports —numbers and types of aircraft do not mean too much unless we know something about where and how they fly now and in the future. In this part of our investigations, our requirements team conducted extensive samplings over a four-day period from Friday through Monday in four of the major traffic hubs—New York, Chicago, Los Angeles and Washington—and four smaller hubs—Norfolk, St. Louis, Albuquerque and Oklahoma City. This was done by photographing radar scopes and actual counting to cover all traffic within a fifty mile radius of the principal airports and to break it down in terms of types of traffic, that is, civil and military by types and whether it was local or itinerant traffic. Counts were made on the basis of the number of take-offs and landings per peak hour at all airports in the area, which we felt gave the best measure of airport capacity demand, and also we counted the number of instantaneous airborne aircraft at a given moment of peak operations as a measure of the potential load on traffic control and communications.

Large Increases for 1975

I will not attempt to go into any detail about these figures, but a few highlights may be interesting. We found, for example, that the Los Angeles area has by far the highest volume of hourly movements, over 500 during the peak hour sampled as compared with 345 for the peak hour in New York and 300 in Chicago. As might be expected, the "mix" of traffic is very different in the various areas. In Los Angeles the percentage of general aviation flying is very high compared to other areas, whereas scheduled airlines activity is relatively low compared to New York. In the Norfolk area, military flying accounts for most of the air activity with very little airline or general aviation operations. While we are not yet ready to give any firm forecasts for the increase in air traffic, it seems probable that overall we will have to expect between two and three times today's volume by 1975. The increase will vary in different areas, of course, and we expect relatively a much greater increase in demand under IFR conditions as the capacity of the system is expanded and pilot proficiency and airborne instrumentation is improved, particularly in the general aviation field.

A Feasible Plan to Solve the Problem

Based on the magnitude of the problem as indicated by our requirements investigations, my systems engineering team has prepared a plan which, if properly implemented, we believe will be capable of providing adequate facilities for the future without undue constraints or an intolerable burden of cost to either the users or the taxpayers. We do not claim it represents the only way the job can be done, but that it is one good way of doing it and also that it is of the utmost importance that one plan of action be decided upon and supported by all interested parties. Obviously, any system must be subject to constant review and continuing experimentation if we are to take advantage not only of existing technology, but important developments which are sure to lie ahead.

Primary Requisites

Basically, any system must fulfill, as far as possible, certain policy concepts of which the following four points are of fundamental importance:

1. That a single National Aviation Facilities System be capable of meeting the needs of the users, both civil and military, on an equitable basis;

2. That the future facility system be compatible with existing systems in a technically and economically feasible manner;

3. That the air traffic control system and the air defense system assist each other to the maximum extent possible;

4. That an effective federal organization for keeping aviation facilities modern be an integral part of the National Aviation Facilities System.

The Operation of Two Modes

The System, as envisioned by the Team, would utilize a division of the airspace for the operation of two modes. The first mode, called the all-weather mode, would apply

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above certain specified altitudes and in dense terminal zones including designated runways. It would require traffic control at all times.

The second, called the dual-weather mode, will have traffic control regulations similar to present ones, but requiring speed limits and minimum cockpit visibility standards.

Air Space Reservation Continues

The airspaces assigned to each of these two modes would not physically conflict, and each would have procedures and pilot proficiency requirements so chosen that each airspace user should be able to accomplish his desired trip while complying with the regulations of the mode that fits his capabilities. Extension of the all-weather mode should eventually cover enroute altitudes designated to meet the demands of users wishing traffic control protection at all times. There appears to be space to cover the requirements of the next two decades for all-weather and "see and be seen" altitudes or lanes, and even a third mode involving positive separation for operators not possessing IFR flying capabilities.

The system should continue to use airspace reservation as the basic procedure for separating aircraft, as contrasted to a system which would permit unrestricted flow of traffic with only occasional intervention to prevent conflicts.

Study of the possibility of providing such an arrangement of airspace indicates that horizontal and vertical separations capable of being achieved by foreseeable navigational techniques would be adequate even in most heavily traveled enroute areas such as the one between New York and Washington. Parallel one-way airways, speed segregation on airways, non-conflicting crossing altitudes and radar vectoring for "fan out" and altitude change are some of the techniques which will increase the present capacity. In the multi-airport terminal areas, where the aircraft densities are greater, and climbing and descending are standard maneuvers, the System will utilize non-conflicting slant airways, if feasible, which will feed "path stretching" areas before final approach. These techniques will provide a high-capacity feeding system for the runways. Helicopter airways will generally exist only at low, non-conflicting altitudes. Long-range flights will use high altitude, flexible airways, based upon a fixed grid structure.

Successful Evolution in Ground and Air Necessary

The airways system then would consist of fixed airways in dense enroute areas; non-conflicting entries and exits for multi-airport terminal areas; helicopter airways; flexible long-distance airways; using the concept of fixed, reserved airspace blocks, wherever possible, and paths for military air operations such as interceptor aircraft to climb and descend through traffic, and for efficient climbing profiles for strategic missions.

(*Continued on page* 128)

At the Convention

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Sheraton-Park Hotel, Washington, D. C.

MAY 20-22, 1957

WESTERN UNION

BLACK BOXES

and NAVY BLUE AIRPLANES

By RAdm. James S. Russell, USN
CHIEF, BUREAU OF AERONAUTICS

RECENTLY, A MEMBER OF THE Joint Chiefs of Staff stated that one of the few subjects which brought forth a divergence of opinion in that group was the future and the uncertainty of having the right answer.

Perhaps nobody can be completely authoritative about the future of aircraft electronics either, except to recognize its spiraling complexity and its snow-balling importance to all air weapon systems.

A good way to get a "reading" on future expectations for the electronics industry is a glance at the past. There have been rapid and exciting developments since 1945. The electronics equipment in a Navy World War II fighter was elementary and naive when compared with the electronic capabilities of today's aircraft. In the coin of the airplane designer, pounds avoirdupois, the World War II fighter carried about 220 pounds of electronic gear. Today's Navy fighter packs at least five times that by weight, and much more than a five-fold increase in diversity and versatility of performance.

Yet even with these unmistakable indicators of good progress in the airborne electronics art, we must assess the 1957 state of black box affairs as being on the threshold of greater things rather than as having already accomplished them.

We must also recognize the fact that military aircraft electronics requirements for the next ten years will place even greater pressures upon the industry than were experienced during the past ten. There are several specific reasons for this, from a Naval aviation viewpoint and as we are concerned with them in the Bureau of Aeronautics.

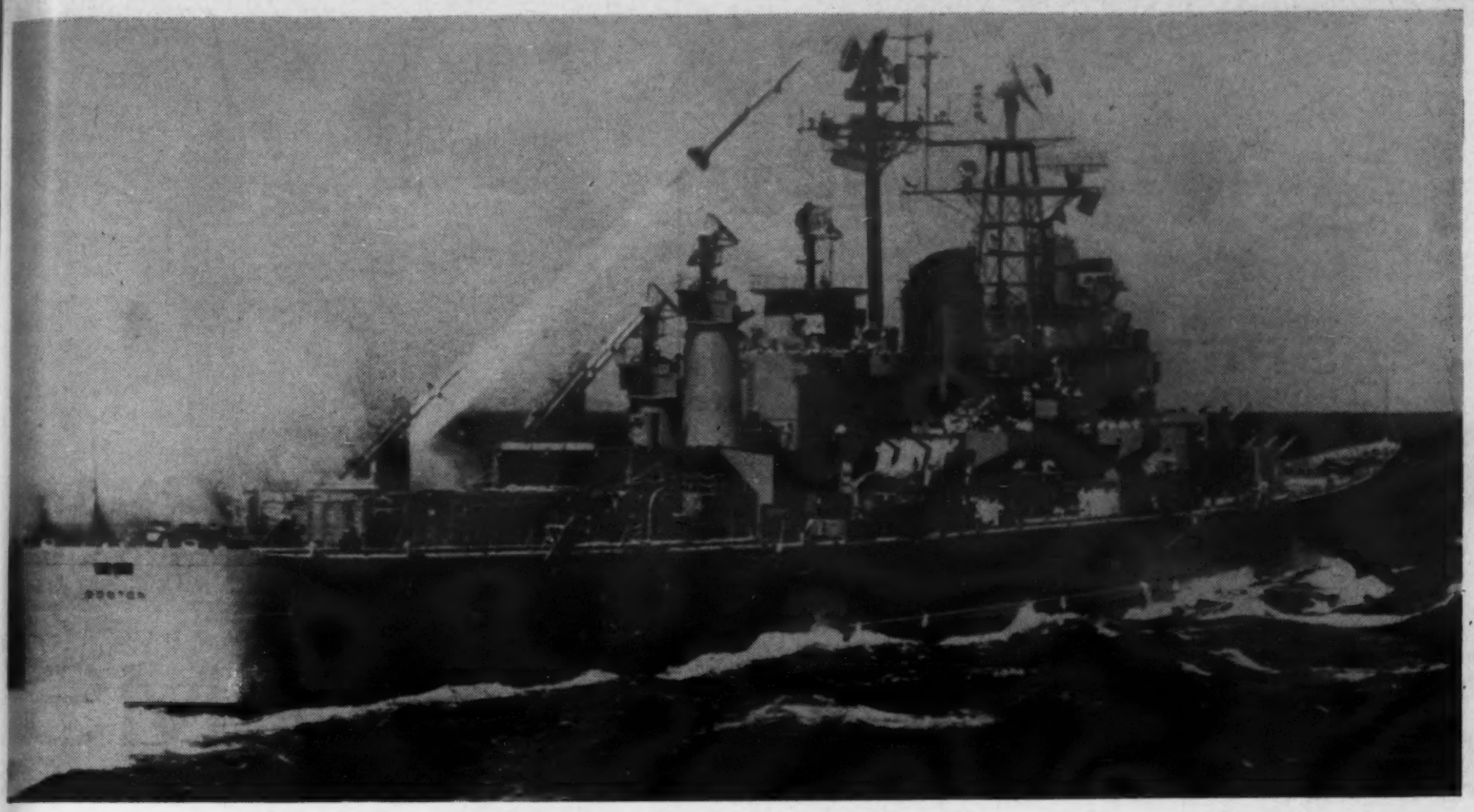
Naval air tactics seemed pretty well advanced and near perfection at the end of World War II after carrier aviation had been flame hardened in battle. Self satisfaction, though, was not long for the Naval airman. The post-war emergence of nuclear weapons, guided missiles, high performance aircraft, and high performance submarines, soon made sweeping changes in tactics and strategic concepts.

The tactical use of nuclear weapons literally broke the old concepts for naval task forces, and gave rise to new ship dispersal patterns—patterns which at once must provide security from nuclear bombardment

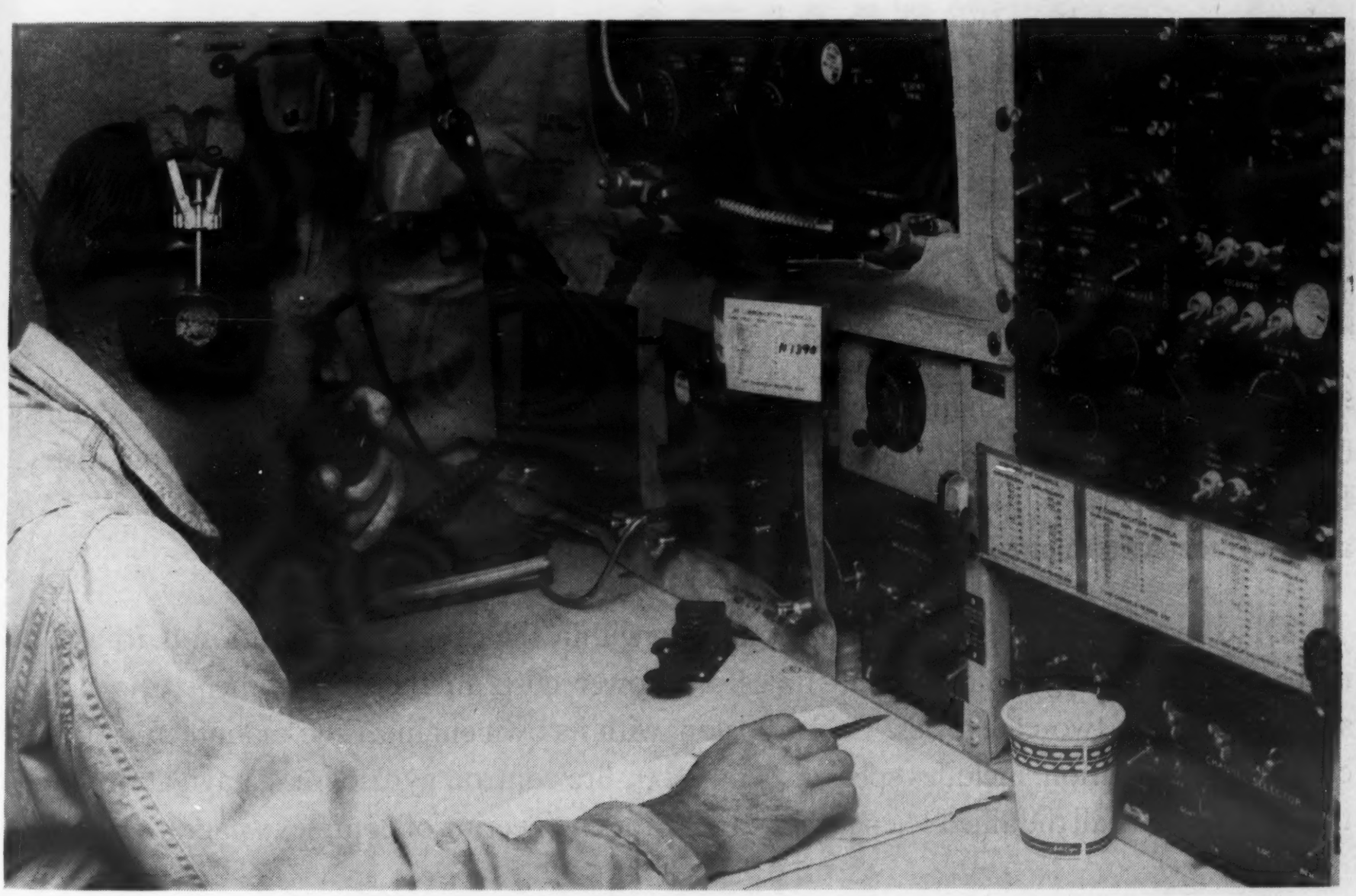
(*Continued on page* 72)

The Author

Commissioned Ensign at the U.S. Naval Academy in 1926, Rear Adm. Russell attained his present rank in 1953. He received numerous citations for his outstanding service in World War II, and he has been Chief of the Bureau of Aeronautics, Navy Dept., since 1955.



USS BOSTON (CAG-1) launching Terrier Missile.



Chief Aviation Electronics Technician T. R. McConnell, USN, tests radio equipment and establishes communication with remote commands in order to flash alert to carriers, bases and fighter airplanes over a wide area. Defensive measures are geared to swing into action within seconds from alert. Here he is using high frequency voice channel to communicate with Navy Early Warning Squadron One Headquarters, but he can switch to code transmission and reception as necessary.

SPERRY ANNOUNCES

TWO NEW WEAPON SYSTEMS DIVISIONS

CARL G. HOLSCHUH, *President of Sperry Gyroscope Company.*

"In the years ahead, the nation's requirements for new and more efficient weapon systems, delivered at maximum speed and minimum cost, will impose greater demands on industry. For its part, Sperry is moving to meet these demands with the formation of our new Air and Surface Armament Divisions.

"Objective of this product-team realignment within the Sperry organization is to assure more advanced design, shorter lead times and lower costs in the development of weapon systems in these two categories. Each division, with its own engineering, manufacturing and contract organization, includes specialists in radar, fire control, gyroscopics, navigation, inertial guidance and all the allied sciences essential in the engineering of complex weapon systems."

C S Holschuh

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SAMUEL AGABIAN has been appointed Manager of the Air Armament Division. Formerly works manager, Mr. Agabian is an Annapolis graduate and former Marine Corps officer. His work at Sperry has included responsibility for computing gunsights, bombsights, antiaircraft devices, radar and infrared developments.

AIR ARMAMENT

Air-to-air missiles and systems
Air-to-surface missiles
Airborne radars
Airborne beacons
Airborne electronic countermeasures
Bombing-navigation systems
Aircraft fire control radars
Airborne inertial systems

MYRON D. LOCKWOOD, manager of the Surface Armament Division, was formerly a systems engineering director. A World War II Lt. Col. of Artillery, and military-technical advisor at M.I.T., Mr. Lockwood has been associated with Sperry projects in underwater torpedo fire controls, guidance computers for missiles, antiaircraft control systems and inertial navigation equipment.

SURFACE ARMAMENT

Surface-to-surface missiles
Surface-to-air missiles
Ground and shipboard search radars
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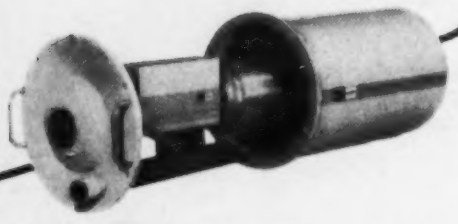

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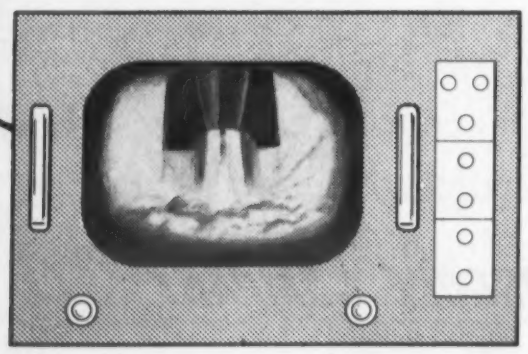

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and yet allow effective use of the ships as a force or fleet. Guided missiles have introduced new armaments for both air and surface elements. High performance aircraft with operational speeds above the sonic, and with great striking capabilities have given the total seapower potential of this country a new lease on life. Last, but not at all least, the high performance submarine is keeping the anti-submarine-warfare people awake nights trying to figure out a way to beat the unholy combination of nuclear propelled subs and guided missiles.

Superior Naval Operations Through Electronics

These are just a few of the salient post war developments and what they mean to the Navy. If there is one single element that is both common and vital to all of these brilliant technological advances, it is electronics equipment and the electronics application to each. Ultimately, the "new Navy" may well come to be described as the "electronic Navy."

Since the Bureau of Aeronautics is responsible for providing the Fleet with the materials of Naval aviation, we run the gamut from research to procurement via development and pilot production. Consequently, we are in vantage point to see the full chain of events. We can observe, at first hand, the evolution of the modularization idea from its inception to production installation.

From such a vantage point is noted the fine progress made to date in the field of aircraft electronics. Some of the advances most meaningful to Naval air operations are: the development of inertial navigation systems which help solve over-water navigation problems; the appearance of automatic control systems which began as fire control systems and which with the new airborne digital computer will open the way to complete centralized control; improved communications systems which have increased the number of available channels as well as having added sensitivity and stability; and the development of the tactical navigation system known as TACAN.

Over The Horizon

In the guided missile field, many kinds of guidance systems are now evident, active, passive, and semi-active, where a few short years ago the whole idea of the practicability of the guided missile was undetermined.

These improvements are instruments which have been produced and are in operational use. Today, they are in the airplanes and the guided missiles flown by the Fleet and this is important to the country and to the Fleet.

Also of importance to the country and to the Fleet are the things yet to be done—"the gear yet to be got." Again, it is in terms of hard-headed practicability, or what is useable and what will work, that we set our sights on Fleet needs.

In the area of manned aircraft, an urgent need is the means to facilitate and simplify the act of flying, per se. The complexity of today's high performance jet airplanes is such that

(*Continued on page 74*)

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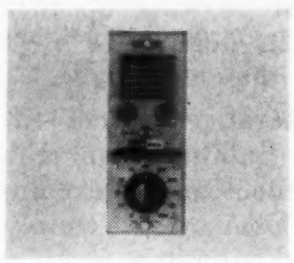

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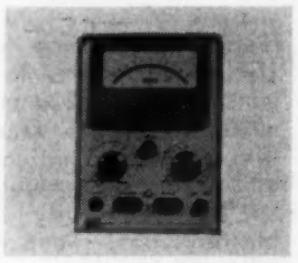

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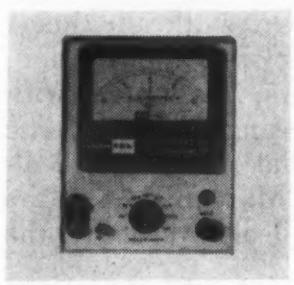

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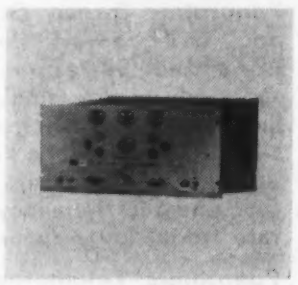

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LF-2

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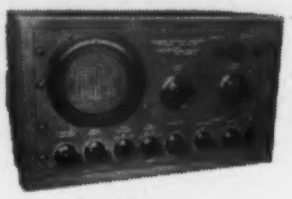
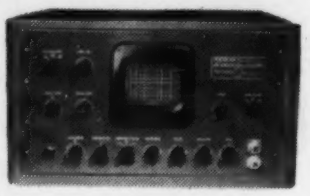
LP-1a

Panoramic Ultrasonic Analyzer, Model SB-7aZ for waveform analysis, 1 kc—300 kc, features continuously variable linear scanning widths and resolution, linear and log amplitude scales, exceptional sensitivity.



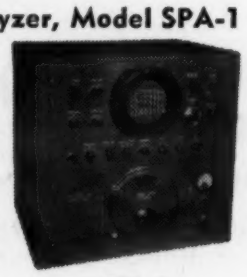
SB7aZ

Panoramic Panalyzors and Panadaptors for RF, VHF, and UHF spectrum analysis feature continuously variable sweepwidths, resolution and scan rates; long or short persistence displays, linear or log amplitude scales, and are unique in that they offer the advantages of wide scan display yet permit examination of closely adjacent signals. Special features, sweepwidth, scan rate and resolution vary with the model and type selected. 5 models in 21 different types fulfill almost every need from low-cost general purpose instruments to those for highly special applications.



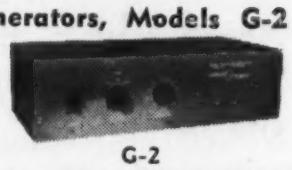
SB-8b

Panoramic Spectrum Analyzer, Model SPA-1 for microwave spectrum analysis, 50 mc—4000 mc, features two tuning heads (RF-2 from 50 mc to 250 mc; RF-3 from 220 mc to 4000 mc in five ranges), with a single tuning control dial having an accuracy of ±1%, continuously variable resolution, sweep rate and differential markers, —100 dbm sensitivities.



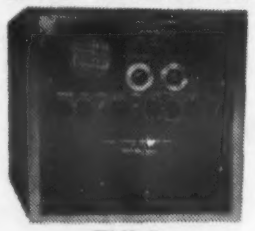
SPA-1

Panoramic Sweep Generators, Models G-2 and G-3 convert the LP-1a and SB-7aZ, respectively, into single line response curve tracers, discriminate against noise and hum, show response to fundamental frequency only and assure accurate frequency response measurement.



G-2

Panoramic Telemetering Instruments provide a simple, reliable almost instantaneous method of checking FM/FM telemetering or carrier current system operation. These consist of Model **TMI-1** Panoramic's Telemetering Indicator and **Models TMC-1, TMC-307, TMC-211** Panoramic's Telemetering Frequency Calibrators.



TMI-1

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pilots must be quasi-engineers to get the most out of the airplane or to operate it properly. Some sort of electronic instrument display, together with more automatic flight control and navigation elements, may be the trend and the answer here. It is a big problem and it is a serious one

Two Important Fields

In the guided missile area, two fields appear to be of prime importance. One is the vital need for breakthroughs in the art of electronic countermeasures; the other is the urgent requirement for detection and "anti" gear to cope with the ballistic missile from a defensive attitude.

Another specialization of great concern within defense electronics is improved equipment to locate and destroy hostile submarines. It is mandatory that we achieve a "transparency of the sea" if we are to hold our own defensively against teams of nuclear propelled submarines, the true submersibles.

In all the black box areas we need greater ranges, greater flexibility and interchangeability, higher reliability, more standardization, shorter lead times from inception to production, more fully automatic systems, and some effective brakes on the rising costs.

Confidence In Communications

Indeed this is quite a package to ask of a young industry which has been so busy just growing up that it has multiplied its dollar size by a factor of ten over the past decade.

But the cooperative forces at work within the industry and the military establishment so well exemplified by the AFCEA will certainly insure the printed circuitry for getting the job done. In connection with this sort of teamwork, the theme of the 1957 AFCEA Convention, "Marconi to Mars," is noted with more than a passing interest. The feeling prevails that industry will always supply the "Marconis," and the Armed Forces will always define the "Mars."

It is this sort of working relationship that breathes into the Navy airman a confidence that his men will never report the failure of a mission due to the lack of proper black boxes. It is this sort of working understanding that allows Naval aviation to position its needs in the proper industrial channels with a minimum of static and with a clear reception.

Telemetering . . .
THE INTELLIGENCE LINK

By Martin V. Kiebert, Jr.

Director of Electronic Development
MIAMI SHIPBUILDING CORPORATION

When considering this article on "Long Range Telemetry and Remote Control Systems," I was reminded of the subject matter contained in a paper I presented before a joint meeting of the Royal Aeronautical Society and the Institute of Aeronautical Sciences held in London in 1947. At that time the comment was made that the pilot, as we then knew him, was becoming obsolete. As a pilot talking to pilots, you will appreciate the raised eyebrows and red faces that greeted this statement. I pointed out that this obsolescence was coming about due to the larger control forces required in higher speed aircraft; the higher aerodynamic performance of the newer and higher speed aircraft which could not be manually controlled adequately as a result of the limiting, relatively slow perception and response of man; and due to the many, inter-related power plant and fuel management requirements which virtually required a relatively complex computer in order to solve these problems satisfactorily. Accordingly, and as predicted, the role of the pilot who was originally a navigator, a power source, the automatic pilot, and a power plant engineer, has already changed significantly with the advent of the DC–8 and 707. In the case of rocket powered aircraft, the change is even more drastic, and as such the pilot has become obsolete and will likely be only an executive in general charge of the flight.

Air Traffic Control Problem

Telemetering techniques can provide and will be required to provide answers for the two most significant aspects of extra-atmosphere flight. These are:

A) What is the environment that space vehicles (and subsequently their occupants) will be required to survive and surmount?

B) What are the surface conditions and environment of the celestial body on which it is proposed to make a landing?

Some of the answers to the first question are now being obtained; many others will be learned as the International Geophysical Year (IGY) progresses, satellites are established, and environmental data is transmitted back to earth via the proposed telemetering links.

With answers to the first question and evolution of equipment and techniques which will permit survival of the spacecraft and crew, the next phase of controlled space travel must deal with the Space Traffic Control Problem. Telemetering and Remote Control techniques appear to be the keystone of this aspect of space flight—even as they may ultimately provide the most tenable and best solution to our present Air Traffic Control Problem.

Phases of Flight Path

It is pointed out that there now appear to be three phases of the trajectory or flight path of a space craft. These are:

1. *Take-off* from the earth's surface which will probably refer to the earth's gravitational field and true north.
2. *The cruise portion* of the trajectory which will probably depend upon celestial navigation either by optical or radar means, with some small potentiality of receiving some guidance from the earth.
3. *The Landing Problems* of a Space Craft on a Celestial Surface. This imposes severe difficulties due to the fact that ground based facilities may not be available, initially or normally, and magnetic references will be of no significance while gravity considerations on another celestial body will probably be entirely different and will pose new stabilization problems. Telemetry will serve as an extremely important element in the landing of space craft on previously unexplored celestial bodies. It is visualized that suitable shock-protected landing drops of telemetering equipment could and should be made prior to actual landing of a space craft on an unexplored celestial area. Such equipment might include sensory instruments which could indicate the nature and density of the atmosphere: the gravity, magnetic orientation, the nature of the chemical content of the atmosphere, and the general superficial environmental conditions which will

be significant in the ultimate landing of extra-atmosphere space equipment and the power required for such descent.

4. *The return trajectory* will again have the take-off problem (from a celestial body); the return cruise problem will not be unlike that of the original cruise phase of the flight path, and the landing problem will again necessitate re-orientation of the space craft coordinates to the earth's coordinates. Instead of the pilot requesting his "altimeter setting," he will now request the information required to reset his gyro references to a particular point (coordinates) at a particular time.

Associated with the foregoing trajectory problems is the unique need for a precision, on-board time standard required for the solution of navigation problems. This will probably be a frequency standard based on nuclear resonance phenomena. I do not, however, care to go into the relativistic problems and philosophies that give rise to some intriguing ideas.

Fuel and Power Requirements

The fuel and power requirements for space craft will necessitate accurate trajectory control. It is possible that telemetering and remote control techniques may help to minimize this problem. It is possible that nuclear fuels for take-off and landing may provide a material improvement over current payload to fuel ratios which are now formidably "stacked" against space travel. Once out of the earth's gravitational field, however, the use of photon emission, perhaps the use of electromagnetic fields and/or the gravitational fields of other celestial bodies, may help to speed the traveler on his way. The present state of the art, wherein twenty to forty tons of missile and fuel are required to place a twenty pound orbital vehicle in its flight path, is indicative of the technological breakthroughs which will be required not only to send manned craft "out of this world," but also to provide for deceleration to the surface of another body, subsequent take-off, re-entry and landing on the surface of the earth at a designated location—even if the time is unspecified.

Power Supply Problem

The power supply problem for instrumentation and control, aside from propulsion problems, also requires careful consideration. The IGY studies and a current missile program have, however, indicated tenable feasibility of several approaches.

The relatively long time requirements for power must be considered carefully for space craft applications. In general, there are four types of power sources which may be used for various in-flight functions. All of these must have long life, the promise of simplicity, and minimization of the fuel problem. These particular power supply sources may be listed as follows: (1) Strontium 90 or Cobalt 60, in high impedance, low energy applications, (2) Direct sun conversion, for medium power and requirements, (3) Peltier effect, for medium power levels and, (4) Miniature reactors for high power levels.

The system components used in telemetry and remote control systems in space craft also necessitate special consideration.

Antenna designs may be derived from current jet and rocket aerodynamic and aeroballistic configurations. Semi-conductors with their low power requirements and high efficiency will probably be used for the majority of the voltage or power amplification requirements. Printed circuits will probably be essential. There is some question as to whether or not magnetic amplifiers will find much application; however, their lack of sensitivity to nominal levels of nuclear radiation and the use of lower density ferramics indicate some potential in the electronic system components. There will be problems of cosmic rays and nuclear energy shielding which, however, will not be too difficult to evaluate after the IGY findings are available and additional studies have been made.

Telemetering Functions

Manned space craft will probably employ telemetering and remote control functions (as aided by both carried and ground based computer facilities) for the following functions:

(1) Telemetry can be used to fix a landing position provided previous facilities have been so established.

(2) Ground based radar and computers will be available for landing on the earth; however, the lack of these facilities on the celestial bodies now make it appear essential that the space craft must carry its own radar and high frequency response computer system.

(3) Telemetering may be required on the earth as an advisory means as to when and where landings may be made, and re-orientation of inertial references to the earth's coordinates.

(4) The role of telemetering in the landing of extra-atmosphere space craft on celestial bodies.

It appears that telemetry will serve as an extremely important element in the landing of space craft on previously unexplored celestial bodies as previously indicated. Knowledge of both the physical and chemical environment on a proposed celestial body will be essential for survival of both the craft and the crew.

The present re-entry problems necessary to afford the required deceleration appear to be formidable. Orbital trajectories have been considered, as having "bouncing" re-entry techniques. Neither of these appear to be very promising due to the time problems and the thermal shock problems.

It appears to be likely that retro-rocket techniques may be required which will be more readily capable of reducing the re-entry to approximately Mach 2, (twice the speed of sound) or lower. Use of this latter technique, however, necessitates expenditures of large amounts of kinetic energy, which with present chemical fuels, appears to be prohibitive. The use of nuclear fuels seems to provide a more tenable solution to this problem.

Considered review of the foregoing indicates that while evolutionary concepts are required, there is basically little that is revolutionary in the field of space navigation that will be required to permit practicable space navigation and travel.

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2N207A	10 db maximum noise figure version of 2N207
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T1025	general purpose, 10 mc silicon transistor
T1159	high speed silicon switch for speeds up to 5 mc characterized by extremely low switch resistance

ACTUAL SIZE

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SB100	general purpose, minimum f_{max} = 30 mc, beta over 10.5
2N344/ SB101	general purpose, good beta control (11-33)
2N345/ SB102	general purpose, higher beta (25-110)
2N346/ SB103	general purpose, higher minimum f_{max} (60 mc)
2N128	general purpose, with military specifications, beta 19-66, minimum f_{max} 45 mc
2N129	general purpose, with military specifications, beta over 11.5
2N240	switching transistor, $f_{\alpha b} > 30$ mc
2N299	for tuned amplifiers, military specifications, 20 db minimum power gain at 10 mc, minimum f_{max} 90 mc
2N300	for video amplifiers, 50 mc minimum current gain bandwidth product, f_{max} over 85 mc
T1050	high frequency transistor for 50 mc oscillator mixers and 10-15 mc bandpass amplifiers, 22 db typical power gain at 10 mc

Other types with special parameter controls are available.

ACTUAL SIZE

MEDIUM POWER ALLOY JUNCTION AUDIO TRANSISTORS (100 mw)

2N223	39-120 beta driver transistor
T1000	45-85 beta version of 2N223
T1001	70-120 beta version of 2N223
2N224	high gain output transistor, 2N225 is a matched pair
2N226	medium gain version of 2N224, 2N227 is a matched pair

Versions of the 2N224 with various beta ranges and higher betas are available singly or in matched pairs.

AUDIO POWER TRANSISTORS

T1040	40 volt, 7 watt power transistor, thermal drop 3°C/w maximum
T1041	40 volt, 10 watt power transistor, thermal drop 2.5°C/w maximum
T1167	60 volt, 12.5 watt power transistor
T1168	80 volt, 12.5 watt power transistor

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THE SERVICES OF AERONAUTICAL RADIO INC.

by
John S. Anderson
PRESIDENT
AERONAUTICAL RADIO, INC.

IT WOULD HARDLY BE RIGHT TO say that Aeronautical Radio, Inc., long known as "ARINC", defies description, but it is in some respects unlike any other company. Fundamentally, it is a communications company specializing in air-ground-air aeronautical mobile service and point-to-point aeronautical fixed service. It serves its member companies also as a technical meeting center at which service requirements, equipment characteristics, and plans and programs generally are thrashed out. Also, it engages in research in a field that, like the weather, has heretofore been the subject of more conversation than action: reliability of electronic tubes, equipments, and systems.

The airline companies are the principal owners of ARINC, as well as the principal users. It follows, therefore, that there is no profit motive, no sales department, no advertising. Nevertheless, it is organized as a normal corporation—vintage 1929—under the laws of Delaware. The air carriers and other stockholders total some sixty in all. But ARINC services are not confined to its stockholders alone, its service roster numbers several hundreds and includes the CAA, the military, and many foreign flag interests.

A Kaleidoscopic Blanket of Radio Coverage

The task assigned to the largest branch of ARINC is the administration, control and operation of the air-ground-air and point-to-point ground radio stations. These stations, which through the years the Federal Communications Commission has licensed ARINC to operate, may be considered in two general groups: (1) the lease-contract stations that are airline-owned, airline-staffed and are fitted to the needs of a single airline; and (2) the ARINC-owned, ARINC-staffed facilities that are patterned to meet broader requirements. Facilities leased from outside concerns may of course be found in either group. To portray the total domestic service furnished by all of these non-governmental ARINC stations would be simply to show the breadth and width of the United States densely populated with radio facilities producing a kaleidoscopic blanket of radio coverage. On the accompanying map, however, are outlined the services of ARINC's station operations—those that are patterned to the broader requirements and staffed by ARINC. The domestic air-ground-air communication service is predominantly on the very high frequencies (VHF) but high frequency (HF) services are an essential adjunct, and the overseas air-ground services each require one or more families of a selected series of high frequencies for each route area. Since this HF coverage cannot be well shown on the map, the services of each station are simply tabulated.

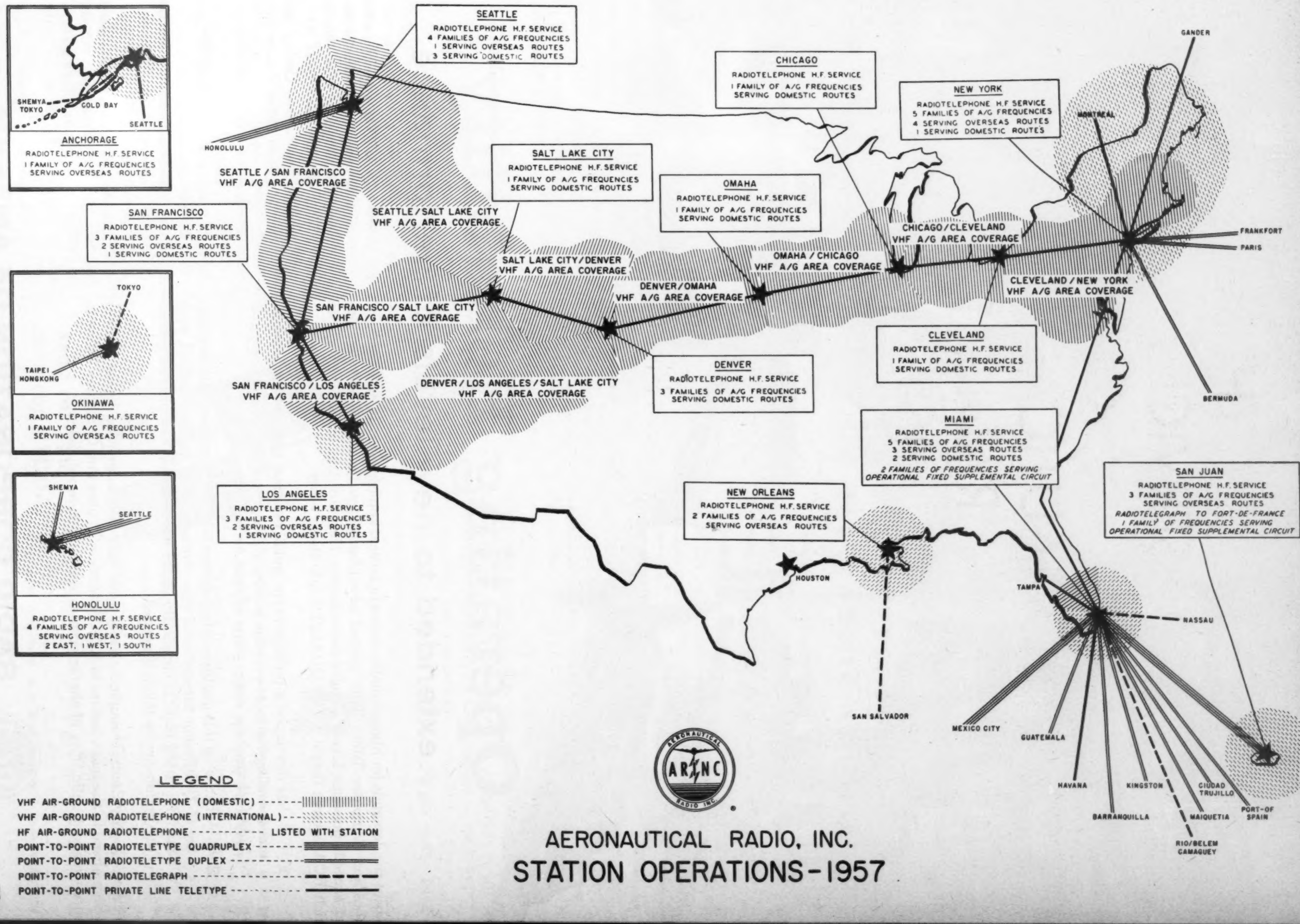
High Frequency Services

The high frequency services are normally furnished through ground-to-air AM transmitters of 3-5 kilowatts power, and air-to-ground single-channel crystal-controlled receivers. Antenna design, governed by service requirements, includes the more elaborate directional arrays and spaced diversity, as well as just ordinarily good non-directional radiators. In the overseas point-to-point services, plant facilities follow the same general pattern. And in all of the plant engineering, exceptional attention is given to high speed, flexible, conven-

(*Continued on page* 81)

The Author

J. S. Anderson, President of Aeronautical Radio, Inc., since 1951, has been active in aeronautical communications for nearly 30 years, particularly in international communications. In World War II, he was promoted to Colonel and commanded the 6th AACS Wing.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ient control facilities which, through cable or special microwave equipment, connect the operating location and the remote transmitter and receiver sites. Significantly, the remote facilities are unlike those of many communication companies in that they are unattended, the installations having been engineered for automatic operation.

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(Continued on page 82)

HOW TO GET LICENSED

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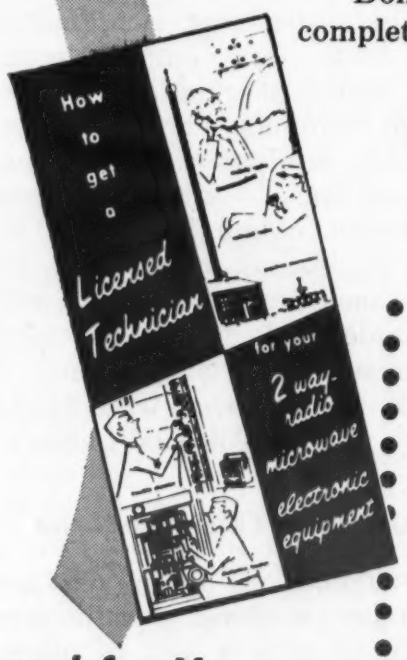

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voice communications of today.

The oldest function of ARINC—"oldest" in the sense that the function existed even before the company was chartered in 1929—is to serve as a technical meeting center. In recent years, the demands for coordination of complex systems and standards necessary to national and international aircraft operations, have brought into being a branch of ARINC which specializes in conducting the necessary committee and conference activities. It is this branch which provides the secretariat and general housekeeping services for the Airlines Communications Administrative Council, the Frequency Committee of that Council, and other special committees through which industry coordination is accomplished on a wide variety of communications requirements, plans, and programs. Here also, industry opinion is formulated for presentation to the Government Industry Radio Technical Commission for Aeronautics (RTCA), to Government committees, and to international conferences, as appropriate, such as the International Civil Aviation Organization (ICAO) and the International Telecommunications Union (ITU).

While these few paragraphs make no pretense of covering the subject of airborne electronics, the task of the Airlines Electronic Engineering Committee (AEEC) deserves more than a mention. The development of successful systems and sound standards, whether in RTCA, ICAO or elsewhere, depends greatly upon technical guidance, such as is offered through the work of this Committee. Also, in order that manufacturers might best meet common requirements, technical guidance is offered through conferences and the issuance of AEEC equipment "Performance Characteristics." Airline investment in airborne communication and navigation equipment serves as an interesting measure of the increasing magnitude and complexity of this equipment—about $10,000 in a 1946 aircraft as compared with $150,000 in each of the 1958-1959 models.

Belated Organizations

Throughout all these activities a day-to-day working relationship is maintained with a host of other organizations having related interests; from the closely linked Air Transport Association to those in distantly related fields, and even foreign countries. For, to keep abreast of the state of the art, to integrate the best engineering knowledge and skill for the purpose of meeting the burgeoning requirements, to find acceptance of one good solution in preference to another good solution, all requires coordinative activity of ever-increasing complexity.

Reliability Research

Of the three functional branches of ARINC, the youngest is reliability research. Closer examination will disclose, however, that the search for a definition, a means of measuring, and a program for improvement of this evasive thing called "reliability," commenced as an airline "reliable tube program" some ten years ago. It was seen that so long as development was geared primarily to the home radio market, there was little incentive to give much attention to reliability (accurately predicted life, not just extended life). In consequence, a program was conceived that, on a continuing basis, would give the needed attention to greater reliability in tube types most useful in complex electronic equipment upon which the operation of multi-million dollar aircraft is so dependent. Initially, there were but two manufacturers sufficiently interested to establish production processes necessary to this program and its relatively small market. Fortunately, they were both highly respected and capable of contributing greatly to such an undertaking. The years have added substantial sophistication to the original concept, but it remains fundamentally and simply the application of technically sound field surveillance and analysis, designed to feed back to the manufacturer data that will enable him to introduce the "fix" required to overcome failure patterns as they are disclosed by the field observations. It is obviously a methodical program wherein spectacular advance verges on the impossible. But ten years have seen more than just steady progress. Under military sponsorship, initiated in 1951, the program has been greatly expanded and accelerated beyond all early expectations. Research into the much broader subject, or science, of reliability is now applied to complete electronic systems, and is prospectively applicable to other fields.

Throughout all activities of ARINC, there is the constant and common challenge that tomorrow's requirements will exceed the plans and advances of today.

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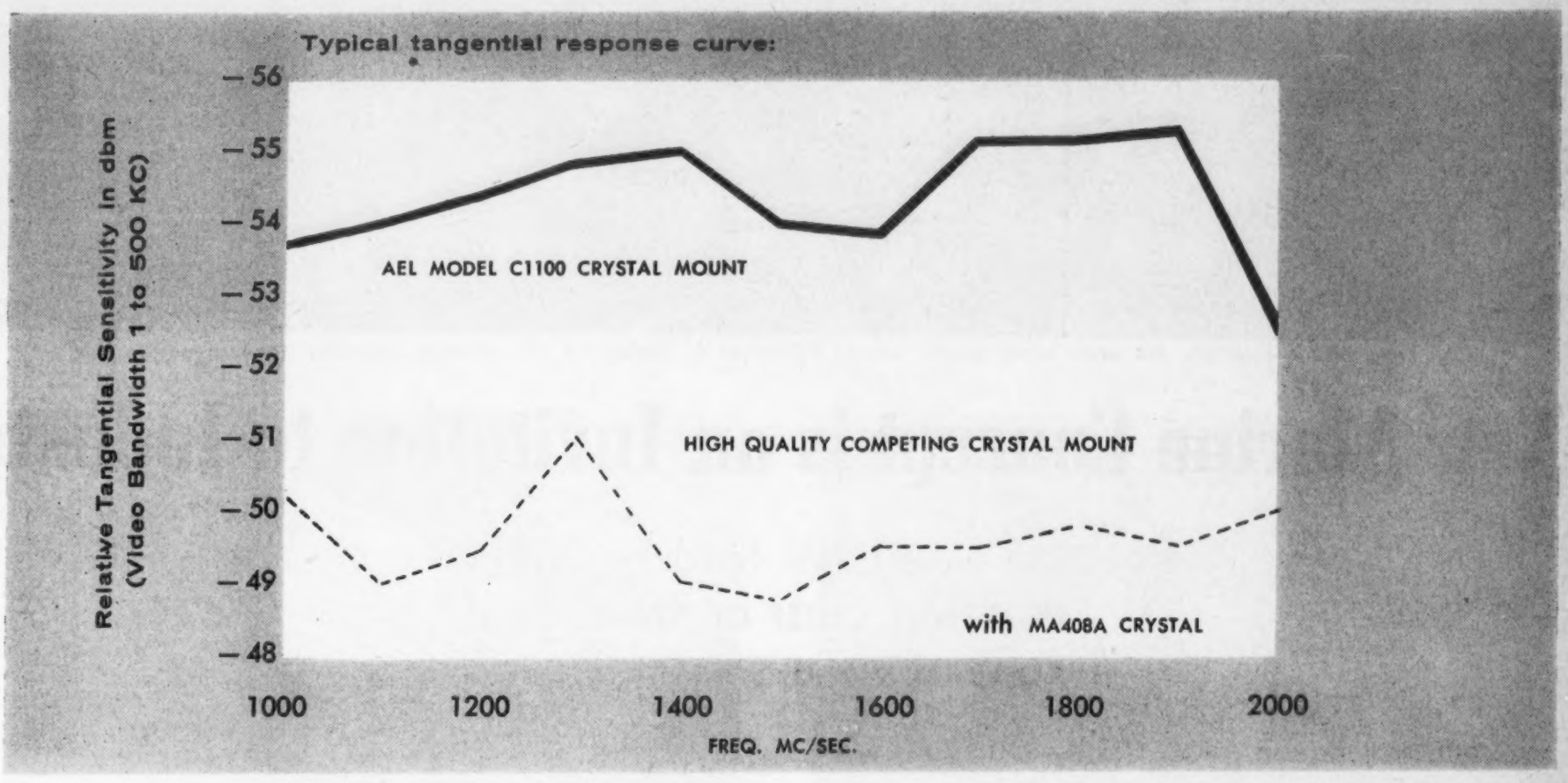
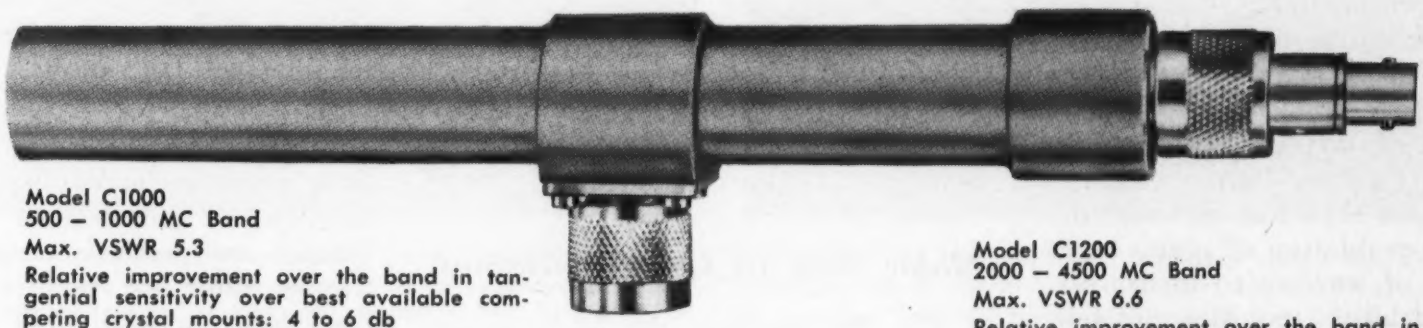


NOTE:
Tangential sensitivity is defined as the power level of the incoming signal at which signal plus noise equals twice noise. "TS" is read when the bottom of the noise inside the pulse is tangential to the top of the noise outside the pulse. It is measured in — n dbm, where "n" is the power level of the signal in db below one milliwatt.



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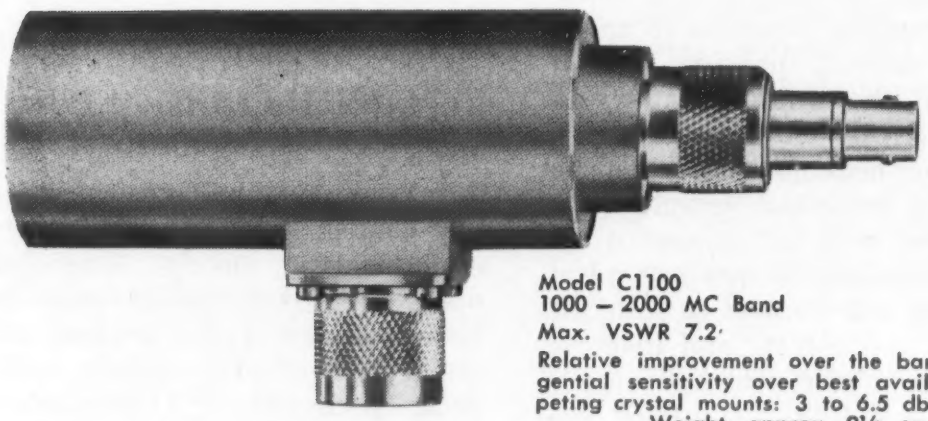

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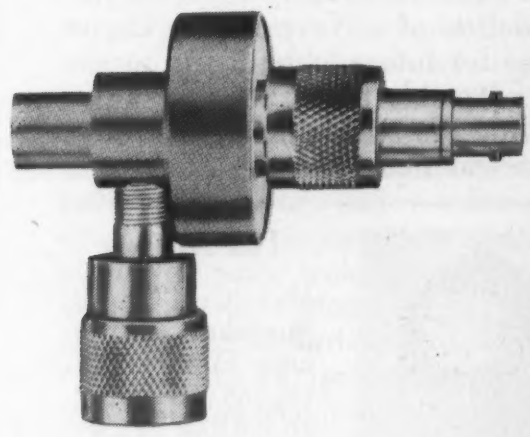

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New Marine Concept is an Invitation to Industry

by Maj. Gen. E. W. Snedeker, USMC
ASSISTANT CHIEF OF STAFF, G-3
HEADQUARTERS, U. S. MARINE CORPS

AMPHIBIOUS OPERATIONS OF THE future, dictated by the needs of the Atomic Age, place more difficult requirements on radio communications and electronics than have any previous types of warfare. Large-scale military operations of the type conducted in the Pacific Ocean area and at Normandy in World War II are a form of warfare that belongs to the past.

The Atomic Age has dictated the need for re-evaluation of many types and phases of warfare to insure dispersion, flexibility, mobility and self-sustenance of combat units. Consequently, new goals under study since World War II have resulted in the formulation of a Navy-Marine Corps concept for future amphibious operations adaptable to all types of wars, including those which do, or do not, use nuclear weapons.

The Author

Maj. Gen. E. W. Snedeker is a veteran of the Nicaraguan and Haitian campaigns, World War II combat and the Korean engagement.

The concept is *offensive*. It is designed to carry the war to the enemy homeland, *exploit* our own atomic or conventional weapons in offensive action, *exploit* the speed of the new Navy, *exploit* the teamwork of the Marine air-ground landing force, and *exploit* the helicopter in attaining a new tactical mobility by eliminating direct assault on enemy-defended beaches.

Major Role of Communications

For the Marines, the basic structural essentials are speed, mobility and flexibility. Helicopters are being used in increasing numbers to speed the initial assault, provide tactical mobility for the initial assault and provide tactical mobility for the troops. The helicopter permits the launching of an initial assault while ships are still well out at sea; it enables the Marines to project naval power deeply ashore, and permits the Marines to concentrate and disperse rapidly, once ashore. The helicopter's speed and mobility facilitate the rapid concentration of Marines necessary to knock out enemy beach defenses and other strong points.

Basic needs for implementing this concept are for new equipment, new tactics, new techniques, and improved forms of signal communications. One of the major problems is to keep pace with the rapid developments of new weapons, equipment and electronics, and of adapting those developments which increase Marine fighting power without reducing mobility and flexibility.

While dispersed, Marine formations must be controlled, and their movements and actions fully coordinated and perfectly timed. Concentration must be fast and flexible, responsive to battlefield intelligence and, again, fully coordinated. Communications developments must keep pace with battle developments.

Increased Distance Poses Problems

In the past, primary dependence for control was necessarily placed upon radio during ship-to-shore movement. Once troops were established ashore, radio became a secondary or standby means, and the primary means of communicating changed to wire circuits. This will not apply in future amphibious operation. Instead, radio and radio relay will continue to be the primary means of communications throughout the entire operation, because of the

UMI

The modern helicopter permits the launching of an initial Marine assault while ships are still well out at sea.

The new Marine Corps concept relegates "wire" to limited use within tactical localities and in rear areas. "Wire" will not be the Marines' primary means of communications in the future.

To support the new concept, "man-pack" radio equipment must be available which operates reliably over ranges of from ten to twenty miles. The old range requirement was five to ten miles.

need for dispersion and increased mobility. "Wire" will probably be possible only within tactical localities and in rear areas.

This increasing reliance upon radio is further aggravated by the new, increased distances between operating units. In the past, the Marine Corps concentrated upon lightweight, waterproof equipment with operating ranges of five to ten miles for "man-pack" radio equipment, and ten to twenty miles for "team-pack" equipment. To support the new concept, radio equipment must be available which will operate reliably over ranges of ten to twenty miles for "man-pack" equipment and twenty to fifty miles or more for "team-pack" equipment. Weight and waterproof requirements remain about the same.

This primary reliance on radio poses many urgent and demanding problems.

First Steps Toward Solution

The first problem is overcrowding of the frequency spectrum. Currently, only a small portion of the frequency spectrum is usable for reliable communications. The Marine Corps has taken a step to move out of this overly-used portion of the spectrum from 2 to 100 megacycles, by sponsoring the development of radio relay equipment in the 5000-megacycle range. In addition, the use of single sideband techniques is being vigorously pursued. The plan is to use single sideband equipment instead of present amplitude modulated radio sets, and to determine the adequacy, acceptability and suitability of this technique over conventional or other known radio transmission techniques to meet the requirements of tactical communication and control.

Secondly, there is the problem of countermeasures. Any electronic device is subject to a counter-measure action and in this lies one of the great dangers in having primary re-

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liance upon radio communication. Much more investigation and development are required in this field.

Equipment maintenance is a third problem. Maintaining complicated electronic equipment in reliable operating condition will be one of the prime problems in providing successful communication support for future Marine amphibious operations. Part of the problem may be solved, of course, by making the equipment as reliable, and as simple to operate, and as easy to repair, as possible.

Challenging Requirements

Finally, range requirements must be considered. There are two means of increasing the range of radio equipment: one, by increasing the power output of the equipment, and, two, by increasing the effectiveness of antenna radiation. The same unsatisfactory antenna systems used in World War II are still being used today. Portable power supplies have not progressed much further than the antenna systems. Increased emphasis is being placed on these two important means of attaining increased range in portable equipment. Unfortunately, the problem of increased range, azimuth coverage and accuracy is compounded by helicopter lift limitations which restrict weight and size of equipment.

Invitation to Industry

While helicopter assault forces will land whenever possible in unfortified areas not immediately defended by the enemy, enemy reaction can be expected to be rapid and violent. Assault forces must be prepared to counter enemy attacks from any direction; they must be equipped to obtain and control rapid and effective air, military, naval gunfire, guided missile and special weapons support anywhere around a 360-degree frontline perimeter. Requirements for electronic surveillance, recognition, and identification, both ground and air, become increasingly difficult.

However, the old, standard requirements for reliability, simplicity and ruggedness, coupled with small size and low weight, still remain.

The challenge of meeting the rigid requirements of new equipment for implementation with techniques proposed in the new concept, lies fundamentally with the Nation's electronics industry!

Telephone Communications . . . *in Hawaii*

By J. Ballard Atherton

President

Hawaiian Telephone Co.

IN THE YEAR 1878, AN enterprising storekeeper on the island of Maui first introduced the telephone to the Hawaiian Islands. His purpose was to provide fast communication between his home and his store—a matter of a few hundred yards.

Four years later a group of Honolulu businessmen founded our company which was chartered by the Kingdom of Hawaii under the name of Mutual Telephone Company on August 1, 1883. The company existed under this name until January 29, 1954. On that day—with a view to better identifying the company with the islands it serves—the name was changed to Hawaiian Telephone Company. In the remainder of this article the Company is referred to as Hawaiian.

By 1894, Hawaiian had acquired control of a competing Honolulu company and was furnishing telephone service to the entire island of Oahu (on which Honolulu is located).

Around the turn of the century other independent telephone companies were organized on the islands of Hawaii, Kauai and Maui. Recognizing the advisability of having all telephone communications in the Territory operated by one company, Hawaiian in 1912 began a program of acquiring these other companies. By 1929, they had all been purchased and had become part of the Hawaiian Telephone System. In 1931 Hawaiian established a telephone system on the island of Molokai and in 1946, built a system on Lanai, the last of the major islands.

Throughout its 73 year history, Hawaiian has been a leader in the telephone industry. In 1910, the installation of an automatic Strowger system in Honolulu made that city one of the first major cities in the world to have dial service. In subsequent years, dial conversions were made throughout the islands until today the Company is 99.8% dial operated with only about 320 magneto telephones remaining in service. They will be converted to dial service in 1957.

Expanding Circuits

Until 1931 communications between the islands was provided over a radiotelegraph system which was one of the earliest regular commercial overwater radiotelegraph systems in the world. In that year, as a direct result of pioneering work done by Hawaiian's engineers and technicians, an inter-island radiotelephone system was installed consisting of single circuits from Oahu to each of the islands of Hawaii, Maui and Kauai. The equipment, which was specially built for the system, operated in the 30-40 megacycle band and was the first of its kind in the world to operate commercially over water at these high frequencies. In the same year, Hawaii was connected to the mainland United States via a single radiotelephone circuit between Honolulu and San Francisco, California.

Changes and Improvements

Many changes and improvements have occurred since that day, 79 years ago, when the first two telephones were brought to the island of Maui. Today the Company operates over 154,000 telephones on the six principal islands of Hawaii, Maui, Oahu, Kauai, Lanai and Molokai and these islands are inter-connected by an extensive network of radiotelephone and radioteletype circuits. A few years ago this network was completely renovated with the installation of modern equipment operating in the 76-110 megacycle band which, after extensive tests, the Company had proven to be most satisfactory for overwater radio transmission for the distances involved. Circuits from Honolulu to the mainland now number 14 and they handle an average of approximately 550 completed calls per day.

Of the Company's 154,000 telephones, approximately 125,000 are located on the island of Oahu. Of these, 103,000 serve Honolulu, a city of 275,000 people, where the principal offices of the Company are lo-

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J. B. Atherton, President of the Hawaiian Telephone Co. since 1950 and a member of AFCEA, has been active in Hawaiian communications since 1935. He is Director of many Hawaiian firms, including Welding & Industrial Products, Ltd. and The Hawaiian Electric Co., Ltd.

cated. It is also the main seaport and the center for all business and tourist activities in the territory. The five outer islands, where many of the large sugar and pineapple plantations are located, are strictly rural in nature, and thus do not have the high telephone development found on Oahu.

Serving the Military

In addition to the telephones served by Hawaiian, there are approximately 18,000 telephones located on military installations. These are confined almost entirely to the island of Oahu which is the Headquarters of the Armed Forces in the Pacific. They include Pearl Harbor, headquarters of the Commander-in-Chief, Pacific, and his joint command; Fort Shafter, headquarters of the U. S. Army Pacific and the Hawaiian Defense Command; Hickam Air Force Base, headquarters for all Pacific and Far East Air Force operations and a transport wing of Military Transport Service's Pacific Division; Fort Ruger, headquarters for the Hawaii National Guard; Schofield Barracks; Fort Armstrong; Barber's Point Naval Air Station and Kaneohe Marine Corps Air Station. All of these installations are served by government owned and operated dial offices and are interconnected by an extensive network of government owned cables. Calls to and from these military installations and the civilian population throughout the islands and the continental United States are routed over connecting facilities between the military telephone system and Hawaiian's system.

In Peace and War

The present extensive military system did not really begin to develop until the defense build-up period which took place just prior to World War II, and, of course, it was tremendously accelerated and expanded during the war years. Even in the pre-war period, however, Hawaiian was often called upon to provide special services and equipment and to assist in the engineering of outside plant and central office facilities. One of the early pre-war services provided was a system to remotely control night lighting facilities at the airports adjacent to Honolulu. Just prior to the outbreak of hostilities, Hawaiian was engaged in assisting the armed services in the establishment of an island-wide air raid alarm system.

It would take pages to fully cover the role that Hawaiian played during the war years in connection with our national defense and in meeting the needs of Hawaii's civilian population. Within hours after the first bombs fell at Pearl Harbor, company technicians, operators and engineers were hard at work providing equipment and services for the Army and Navy. Practically overnight a five position multiple switchboard was installed at Punahou School, a private school in the heart of Honolulu, which was taken over as Honolulu headquarters by the Army Corps of Engineers. To meet the needs of this and many other emergency installations, switchboards were removed from civilian business organizations and many miles of cable and wire were taken from our own supply and turned over to the Armed Forces. Because of the scarcity at the time of telephone engineering personnel in the armed services, company personnel were called upon to engineer and install censorship equipment on all transpacific and inter-island circuits and to assist in the design of facilities for the Army Traffic Control Center. In addition, an engineer was loaned to the Army for over six months to assist in the basic design of the telephone network required to meet their war-time needs. In the months following Pearl Harbor, assistance was also given in training service personnel in installation and maintenance procedures, and a special switching system was installed to permit military telephones located in downtown Honolulu to dial directly into the Army and Navy telephone networks.

Rapid Expansion

Despite the unavailability of telephone equipment during the war years, except in limited quantities to primarily serve defense needs, the company added approximately 4000 stations between 1942 and 1945. This was done to serve high priority subscribers and was accomplished by overloading existing facilities and forcing lower grade four-party service. Consequently, Hawaiian entered the post-war period with an overloaded plant and a backlog of approximately 8,000 waiting applicants. At the end of 1945, the company had approximately 55,000 telephones in service.

High Post-War Demand

Because of the tremendous government spending in Hawaii during the war years, an increase in the overall

economic health of the Territory, a rapidly expanding tourist industry, and the low ratio of telephones per 100 population, demand for telephone service in the post-war years has been exceptionally high. From 1946 to 1956, the company sustained the greatest growth in its history. In a period of eleven years it gained 99,479 telephones, representing an increase of 182% over the number of telephones in service at the end of 1945. At the end of 1956, the ratio of telephones per 100 population was 29.2 as compared to 12.0 in 1945. Incidentally, held orders which in 1948 were near the 11,000 mark were virtually eliminated by the end of 1953.

Dial Service Extended

During this period many improvements were made. In addition to converting more and more areas to dial service, extended area dial service was introduced and toll charges eliminated wherever possible. This program has progressed to the point where four of the six principal islands now have completed island-wide toll free dialing service and the remaining two are scheduled for such service by the end of 1958. As early as 1948, as the result of experimental work done by the company's engineers, equipment was installed to permit direct operator dialing between the islands over the radio circuits. This proved so successful in speeding the completion of calls that engineering studies were soon undertaken for possible application of operator dialing on the transpacific radiotelephone circuits. By 1954 equipment was developed and tested for this purpose, and will be in regular use on these radio circuits by the end of 1957.

New Transpacific Cable

In addition to the radio circuits, we will have 36 additional high quality voice channels in operation at the end of the year which will also be equipped for operator dialing. These circuits will be provided by the *new transpacific telephone cable* which will be installed between Hawaii and California during the summer of 1957 as a joint undertaking of the American Telephone and Telegraph Company and Hawaiian Telephone Company. While this cable had originally been contemplated for installation around 1960, national defense considerations advanced by the Office of Defense Mobilization made its earlier installation a necessity. Consequently, both American Telephone and Telegraph and Hawaiian agreed to advance the date for completing this project and the entire project was approved by the Federal Communications Commission. Actual work on the cable began in October, 1956, when the landing section at the Honolulu end was laid from the landing site to a point approximately two miles from shore. This portion will be joined to the deep sea section which will be laid this summer.

Increasing Significance

Hawaii's location, as the meeting place and stopping off place between East and West, and as one of our country's most vital outposts in the Pacific, is constantly increasing in importance and significance. As a result there has been in the post war years a high level of military activity in the islands which has required close cooperation between the communications personnel of the Armed Forces and Hawaiian. This cooperation in general has been excellent as demonstrated by the manner in which contracts have been negotiated or arrangements made for the use of interconnecting and other plant facilities, the provision of telephone centers on military installations to assist servicemen with their local and overseas calls, and the furnishing of special trunking arrangements to permit civilian personnel living in residential areas adjacent to various military installations to dial directly into those installations. In addition, much time has been devoted by Hawaiian to the study of ways and means to provide communication facilities to meet both the normal and emergency needs of the armed services. Hawaiian has not only provided equipment and services for Civilian Defense but has encouraged its employees to assume key positions in the Territory's Civil Defense Organization. Many of its employees also belong to the Hawaii National Guard.

The recent activation of guided missile installations in the islands and the announcement by the Government of the military budget for the islands for the coming year assures the continuation of the present high level of military activity for some time to come. This activity, together with Hawaii's growing economy, means a continuing demand on the Hawaiian Telephone Company to meet both civilian and national defense communication requirements. We look forward to this challenge—confident that we can meet it as successfully in the future as we have in the past.

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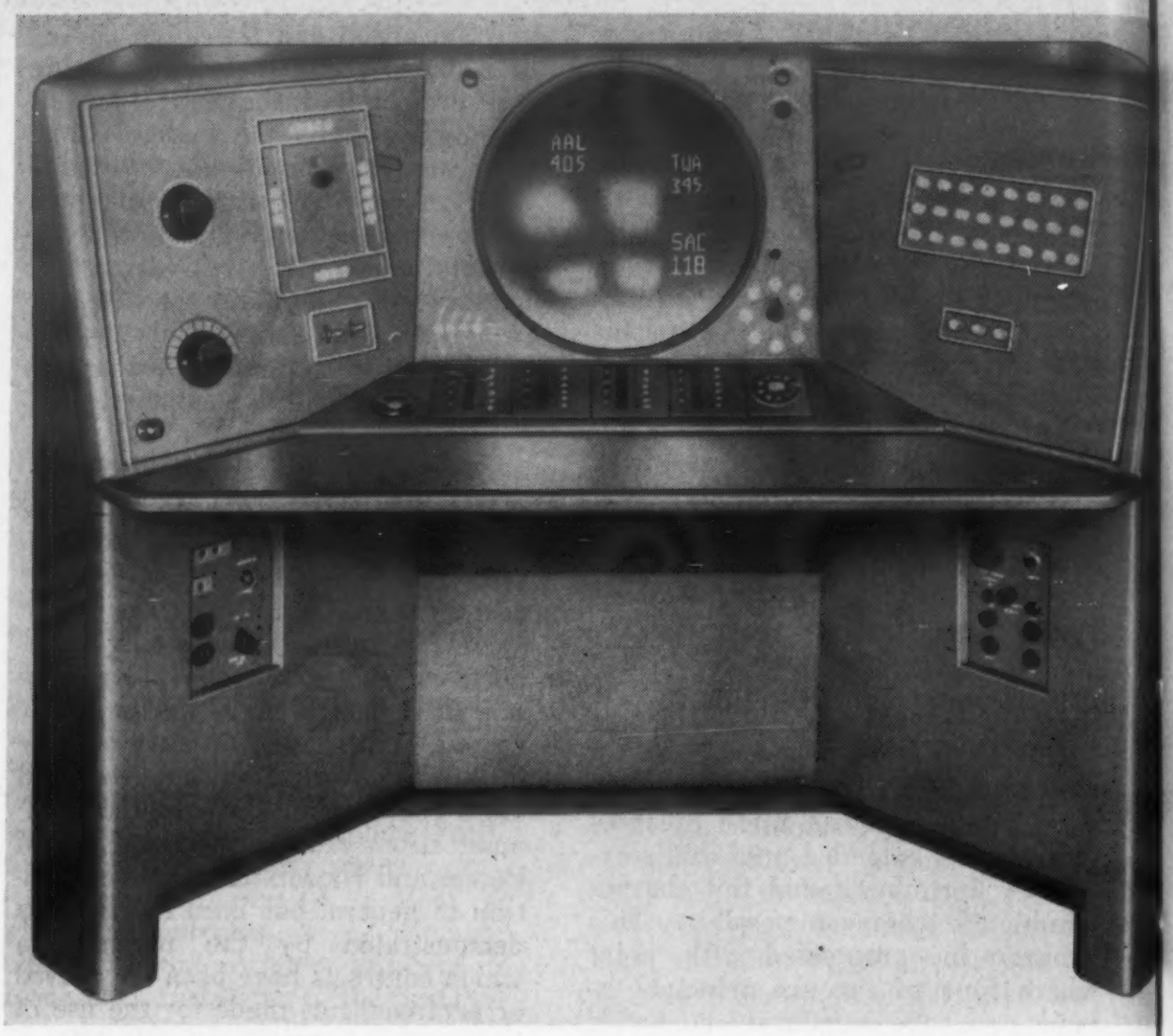


Figure 1

DIGITRON display equipment as applied to a console for the Missile-Master System. Console is joint development of The Glenn L. Martin Company and the Boston Electronics Division of American Machine & Foundry Company.

a new concept in electronic display equipment

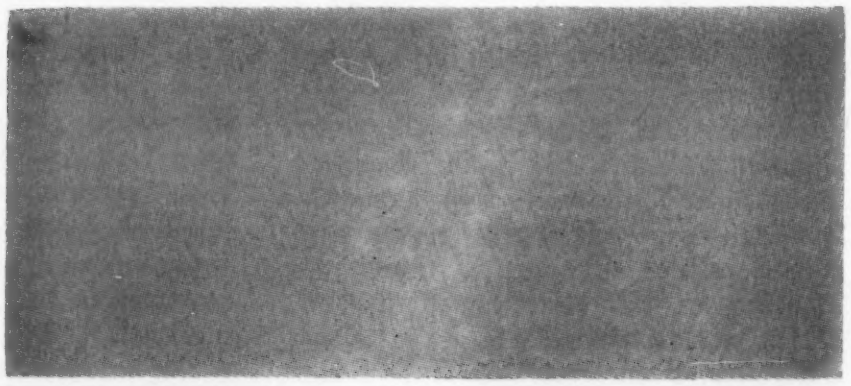
by Dr. W. B. Sell

General Manager, Defense Products Group
Electronics Division
American Machine and Foundry Co.

THE AMERICAN MACHINE & FOUNDRY COMPANY'S Electronics Division in Boston has just recently completed a development program culminating in electronic equipment to be known commercially as the "Digitron" display system. This system was demonstrated publicly for the first time for the industrial-military team at the 1957 AFCEA Convention.

The program which resulted in this equipment was originally conceived by the U.S. Army Signal Corps as

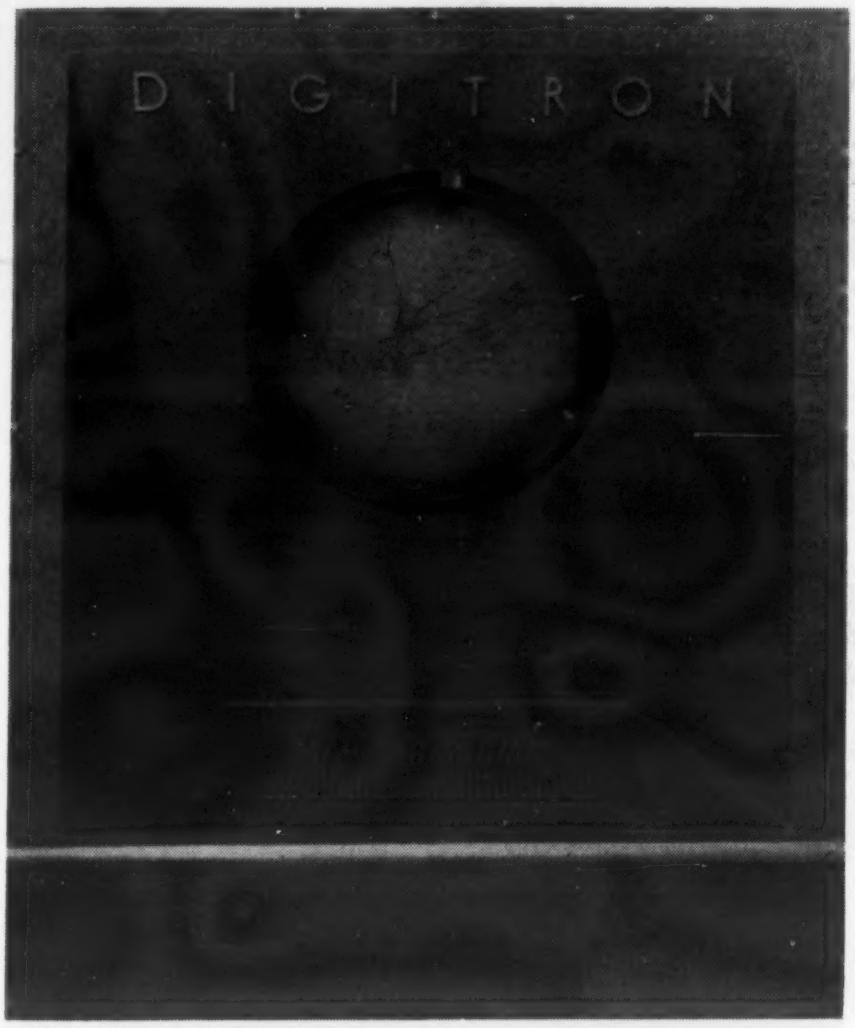
Dr. W. B. Sell is a 1940 graduate of the U.S. Military Academy and served in the Anti-Aircraft Artillery, U.S. Army, until 1954. Upon his resignation he joined Boeing Aircraft Co. as a Project Engineer on the Bomarc Missile and presently is General Manager of American Machine & Foundry Co.'s Electronics Division, Boston.



a replacement for an optical projector in an early air defense data processing center and was awarded to AMFED on a competitive bid development contract. Subsequently another contract was received by AMFED from Glenn L. Martin Co. to produce similar but advanced Display Systems for what is now known as the Missile-Master Anti-aircraft Defense System. A typical display console for the Missile-Master System is shown in Figure 1. Reliability, ease of maintenance, economy of production and human engineering factors were prime considerations in this console design.

Character Generation

In the Digitron System of Electronic Display illustrated in Figure 2, the characters or symbols are formed very simply by causing the electron beam to write out the desired character just as a person would form it with pencil and paper. Flicker-free display is provided by regenerating each symbol at approximately a 20 cps rate. A major advantage of this scheme is the extreme simplicity of the Cathode Ray Tube (CRT), a Dumont K1202, which this system employs. Target plan position (or character major position) is controlled by the magnetic deflection system and yoke. Character painting and symbol minor position are accomplished by the conventional electron gun and electrostatic deflection assembly. All CRT components are standard and the tube is considered a stock item by DuMont. A minimum of Cathode Ray circuits and adjustments is required.



ADVANCED ELECTRONIC DATA DISPLAY EQUIPMENT exhibited by the Electronics Division of American Machine & Foundry Company, Boston, Mass., at the 1957 National Conference of the Institute of Radio Engineers. An air-traffic control display is shown on the screen. Electronic data display systems are used whenever processed electronic information is presented to a human operator. Applications include radar, air and ship traffic control, defense systems, combat information centrals, and general purpose digital computer outputs. Figure 2.

A possible form of symbology available in the DIGITRON display equipment developed by the Electronics Division of American Machine & Foundry Company. Figure 3.

Advanced Developmental Effort

Following the Missile-Master Development Program, AMFED's attention was devoted to discovering new design approaches which would significantly reduce equipment complexity and improve reliability. Out of this effort there evolved a new systems concept based on the application of digital techniques to the control and programming of symbol waveform generation. This new concept had the immediate benefit of reducing the required tube complement by 50% as well as opening the possibility of transistorization with the attendant economies in size, weight and power dissipation. The new concept also provided more flexibility in generating symbology. A possible form of symbology which has been developed is shown in Figure 3. Many other variations are obviously possible. A plug-in printed circuit board is used for generation of each character and is located in the common equipment display generator, thus giving the user complete freedom to select symbols desired. Transistorization of the deflection amplifiers is now under way and transistorization of the waveform generator and console display control circuits will begin in the near future.

Applications

The Digitron display equipment is applicable to any data handling system in which processed information must be presented to a human operator for either (a) end use, or (b) human evaluation and re-insertion into the data handling system.

Typical examples include: (a) Defense Systems, Combat Information Controls (either land, shipboard or airborne), Battle Command Posts, etc., (b) Air Traffic Control, en route controller, approach controller, ground controller, etc., and (c) General Purpose Digital Computer Output; Temporary readout for program verification or permanent high speed readout in conjunction with a high speed camera.

Major Advantages of the Digitron Display System

1. The Digitron employs a conventional Cathode Ray Tube which is a stock item.
2. The symbol forming mechanism is not built into each tube. It is a part of the common equipment which services all indicator tubes.
   (a) Changes in symbology can be effected without discarding existing display tubes.
   (b) Character selection outside the display tube eliminates the necessity for complex electron optics in the basic tube structure and the associated precisely regulated power supplies.
   (c) Display stability is enhanced and many critical display adjustments are eliminated.
   (d) Continuous symbol size control from an inch or more on the diagonal down to a dot is possible on the Digitron display equipment.
   (e) A shorter tube (25 inches over all) results, permitting more compact display console design.
3. The Digitron display is extremely bright, thus permitting operation at high ambient light levels.
4. Transistorization of virtually all of the Digitron circuitry provides an extremely compact and efficient equipment.
   (a) The common equipment can be packaged in the display console or separately in a 30 cubic feet cabinet.
   (b) Low power dissipation (on the order of 150 watts depending on the application) eliminates the necessity for special cooling equipment and enhances reliability.
5. Method of character selection employed makes the symbology extremely flexible. Letters, numerals and geometric patterns may be provided. The user may choose as few or as many as he requires. Moreover, the symbology may be changed after installation of the display equipment by simply changing a single plug-in printed circuit card for each character.
6. The Digitron display equipment has a high symbol painting speed. This may vary widely with the functional requirements for each installation. A typical, conservative value is 20 microseconds.

Summary

Interest of both industry and the Defense Department in this new electronic display is considerable. The application potential for the system appears to be unlimited where high speed display is required. Additional developmental effort now in process will further enhance its potential.

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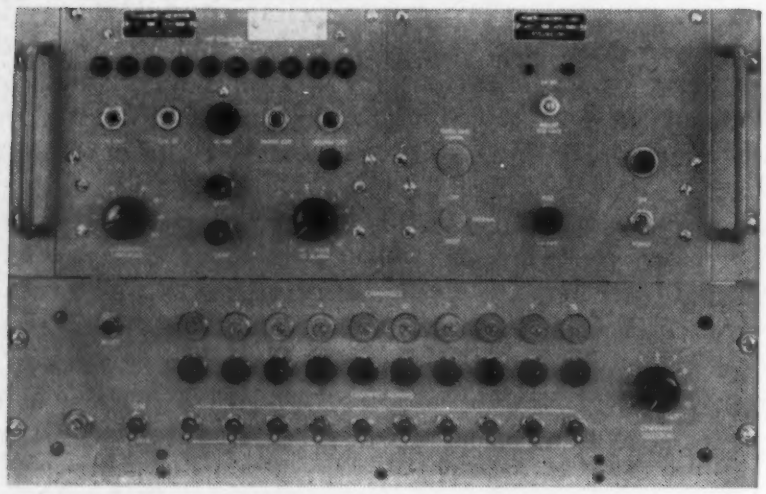

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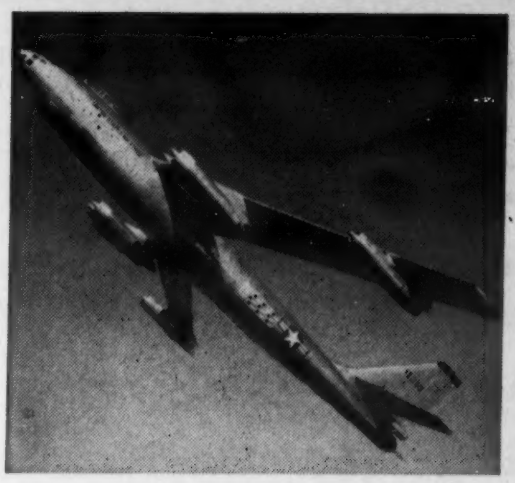

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U. S. COAST GUARD COMMUNICATIONS

By Captain G. Van A. Graves, USCG
Chief of Coast Guard Communications

THROUGH THE EVER-INCREASING magic of electronics the Coast Guard is ever more effectively ON WATCH. All around the coasts of the United States, on the lakes and rivers, in the stormy wastes of the North Atlantic, on the broad reaches of the Pacific, in the Arctic and in the tropics, the Coast Guard is on watch to aid those in distress and to provide guide posts and information to prevent disaster in the air and on the sea. What is communications? What does it do? It provides information, coordination, control and, because of all these things, it provides help when things go wrong. Here is how the Coast Guard uses communications and, briefly, an indication of the equipment with which we work.

The mission of Coast Guard communications is to furnish an efficient communication service to operating and administrative units of the Coast Guard, provide for the receipt of distress information from all sources available, disseminate distress information with the utmost speed and accuracy to all agencies capable of rendering aid, and be so organized and equipped, and have personnel so trained, that amalgamation with the Navy in time of war, or when so directed by the President, may be accomplished with a minimum of operating change.

A Compatible System

To carry out this mission the Coast Guard communications system must be compatible with civilian, military and Coast Guard requirements. Normal communications for Coast Guard operations would require a relatively simple system of communications, but when the compatibility requirement with military and civilian communications is applied, a complex communications system is the result. Coast Guard communications must be prepared to handle traffic to and from Ocean Station vessels as well as ship to shore traffic from Coast Guard vessels operating in the Atlantic and the far Pacific. Also, our communications must be prepared to handle ship-to-shore traffic from merchant vessels when they are required to pass on information of interest to the Coast Guard; traffic to, from, and among Loran stations; broadcast notice to mariners and other marine information; traffic with Coast Guard, civilian and military aircraft, and many other routine services too numerous to mention here. Radio and landline circuits are

(*Continued on page* 96)

In addition to his present post as Chief of Coast Guard Communications, Captain Graves has served as Commander, Naval Forces, Canadian Arctic from 1942 to 1943, and Commander, International Ice Patrol, from 1951 to 1954, as well as two previous assignments in Coast Guard communications.

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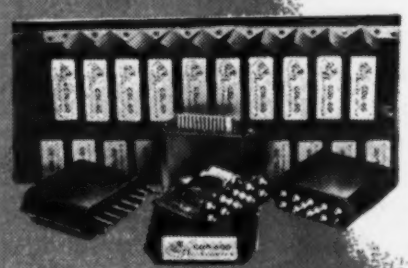
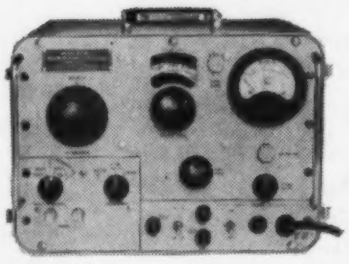
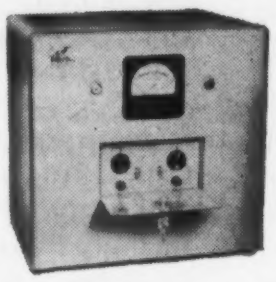


COMPUTER COMPONENTS



CARRIER FREQUENCY VOLTMETER (WAVE ANALYZER)



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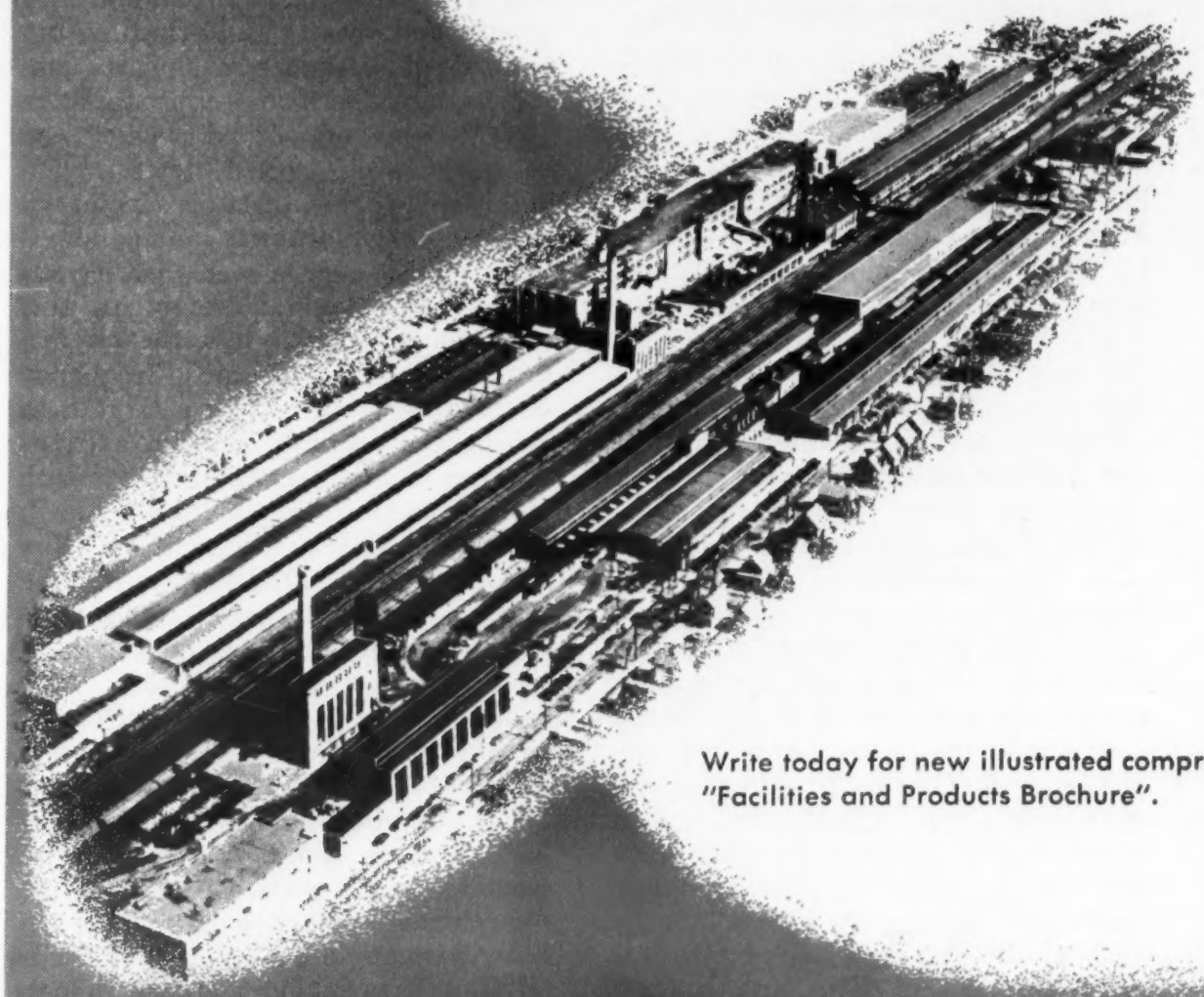

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The coordination of rescues is the mission of the Rescue Coordination Center. The controller (second from left, seated) alerts and dispatches necessary Coast Guard search and rescue air and surface craft. He keeps participating SAR planes and vessels fully informed of the situation as it develops.

utilized for both administrative and operational traffic with the primary attention being placed on operational communications. There exist many types of circuits, namely: teletype, all forms of radio, specialized VHF radio link, and specialized control circuits for aids to navigation, to cover the majority. All of these are integrated into a common system for the rapid handling of messages.

Coast Guard Comes to Doria's Aid

On the morning of 26 July 1956 at 3:10 GMT, the *SS Andrea Doria* and *MV Stockholm* collided 19 miles from Nantucket Lightship. At 3:22 GMT the Coast Guard Radio Station, New York at East Moriches, Long Island, alerted the East Coast Coast Guard SAR Control Net with the report that an auto-alarm signal was heard on 500 kcs followed by the *Stockholm's* call sign "SEJT." This alerted all the Coast Guard rescue coordination centers (RCC) from Massachusetts to Louisiana. New York Radio followed this report with another which said "SOS SOS DE ICEH," indicating it was receiving a distress message from the *SS Andrea Doria.*

Role of Communications

These messages were the first notice of one of the largest marine disasters in recent years. The RCC in New York assumed the task of coordinating all vessels, aircraft, and other services involved in the rescue. For the next eleven hours there was a series of messages from ship-to-shore, ship-to-ship, and ship-to-plane involving Coast Guard, Navy and commercial forces. These messages were largely controlled by Coast Guard communications and were concerned with the involved operation of rescuing personnel and attempting to save the *SS Andrea Doria.* News reports had the man on the street spellbound until the *SS Andrea Doria* finally sank and the last reports of the rescue were received. The full story of the sinking and the gallant action of the crews of both the *MV Stockholm* and the *SS Andrea Doria* and all participating units has been told in magazine articles, in commentaries on the radio and in presentations on television.

Rapid Action Saves Lives

Another recent example in which the Coast Guard communications system played an active part is that of the collision in the Delaware River between the *USNS Mission San Francisco* and the Liberian freighter *SS Elna.* Here again the distress messages were picked up on radio by Coast Guard shore radio stations, and again the search and rescue teletype net was alerted. Then commenced a period in which the various radio stations on the East Coast intercepted traffic between the ships involved and those in the adjacent area. The messages they heard were forwarded to the rescue coordination center, thus giving full and complete knowledge of what was happening, permitting direction of Coast Guard forces into the correct area for rescue, and allowing participation to the maximum extent possible. Such rapid action results in a saving of life and property not possible many years ago. During the year 1956, the U. S. Coast Guard in its many operations saved 2511 lives and rescued property valued at $1,178,818,200. The total value of property saved has more than equalled the total money authorized and expended for the Coast Guard during the same year. No monetary value can be put on life, and the 2511 lives that were saved speak for themselves.

Constant Preparedness

The Coast Guard communications system must always be prepared to meet obligations set forth for it by statute or practice and to anticipate any changes. At the present time an extensive guard is maintained on 2182 kcs, the international radiotelephone distress frequency. This frequency is used for both calling and distress traffic. In addition to commercial vessels authorized to operate on this frequency, such as fishing vessels, there are approximately 44,000 non-commercial vessels so equipped in the United States. When it is realized that there is a potential of 300,000 additional non-commercial users, it can be seen that serious interference could develop on this frequency. Add to this the characteristics of the 2 Mcs frequency which propagate it over a large area during the evening, causing a transmission in one area to interfere with communications in another area. It should be readily apparent that communications on 2182 kcs could soon become untenable. To combat this situation, the thinking has been to move much of the traffic of a short-range nature presently on 2182 kcs to the VHF-FM Maritime Mobile Band of 156.3 to 157.4 Mcs. This band contains a calling and safety frequency of 156.8 Mcs and several working frequencies. Being a short-range frequency, it will allow many more persons to use it simultaneously without harmful interference than is presently possible with 2182 kcs. The Coast Guard is making VHF-FM installations in major U.S. ports for port security operations and for pos-

Coast Guard Radio Station, East Moriches, New York, played a vital role in the receipt and dissemination of distress traffic in the ANDREA DORIA casualty.

sible operation on the VHF-FM band as other users become more active.

Scope of Communications

To bring into focus the scope of Coast Guard communications, several types of operational communications will be elaborated on. The primary area of operational communications is that concerned with search and rescue. The illustrations previously given graphically portray how communications were used. Without the rapid means to alert people, to tell them where to go and what to do, the Coast Guard would be helpless to prevent the loss of lives and property. This same type of situation is repeated day after day in varying degrees. Perhaps today it is the saving of a small pleasure boat in the waters off Florida, or it might be the rescuing of personnel from a crashed military aircraft, and then again it may involve rescue of people from a merchant vessel afire at sea.

Dramatic Rescues

A more detailed description of the search and rescue communication system of the Coast Guard follows. There are twelve primary and seven secondary radio stations located along the coasts of the United States. Each of these radio stations maintains an active 24-hour guard on the international distress frequency (500 kcs) and the international radiotelephone distress frequency (2182 kcs). Along the coasts of the United States there are an additional ninety Coast Guard units that maintain a continuous radio watch on 2182 kcs. Within the Great Lakes area sixty-one units are also maintaining a continuous listening watch on 2182 kcs.

It is through this large number of units guarding the important distress frequencies that the Coast Guard is able to receive almost instantaneously the first cries for help that are sent by the mariner in distress. Immediately upon receipt of distress information the rescue coordination centers are alerted by a landline teletype or telephone circuit. The rescue coordination center is the central command post within each Coast Guard district and has means at its fingertips for alerting all other services, both military and commercial, that are capable of providing supporting services in the way of direction-finding, communications, aircraft, and vessels. A direct circuit is maintained with the Civil Aeronautics Administration (CAA) for the purpose of coordinating rescues involving aircraft. Upon evaluation of the information received, appropriate aid is dispatched to the unit in distress.

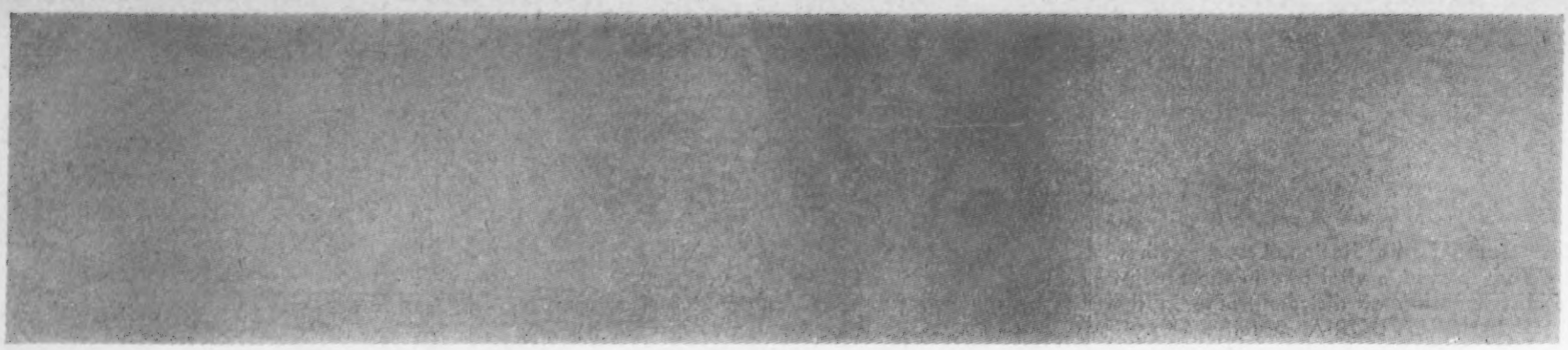
Complex Systems Involved

Operational communications with Ocean Station vessels closely follow search and rescue communications in importance. Under international agreements, the U.S. is required to man four Ocean Stations in the Atlantic and two in the Pacific. The Coast Guard operates the vessels which fulfill the U.S. requirements. Message traffic to and from the Atlantic stations is chiefly handled by the primary radio station at Washington, D. C. The primary radio stations at San Francisco, California and Honolulu, T.H., handle traffic for the Pacific stations. This traffic involves the passing of weather messages to and from the Ocean Stations and the Weather Bureau, and message relays by the ocean station vessels for merchant vessels and aircraft that cannot deliver their traffic in any other way. While maintaining two ship-to-shore circuits, the vessel is also guarding the international distress frequency (500 kcs) and the international survival craft frequency (either 8364 kcs or 2182 kcs). For the handling of aircraft traffic the vessel guards 3023.5 kcs, 121.5 Mcs,, one other frequency in the VHF band and 243 Mcs. A typical communication situation while on station might involve passing position information to one or more aircraft using the VHF or UHF frequencies, and at the same time, sending or receiving weather traffic and relaying a message for a ship or one of the aircraft. The communication set-up aboard these vessels must therefore, of necessity, be complex.

Methods Being Studied

In addition to the above requirements, these vessels must be prepared to operate under the Navy. Here then we see a vessel which epitomizes the problem facing Coast Guard communications, namely that of being compatible with three different types of communication systems.

This brief dissertation on Coast Guard communications can only hope to skim the surface, but it is believed that some idea of the scope of the problem faced can be deduced from these few examples. Constant improvements and modifications are necessary to keep abreast of the advances in the field of electronics. All phases of Coast Guard communications are continually under study in order to obtain the maximum result from the equipment and personnel on hand and in order to keep communications prepared to assist in carrying out the duties assigned to the Coast Guard, whatever they may be.



modern | press communications

By Eustace Florance, Jr.

AMONG THE MANY SERVICES WHICH the U.S. Communications industry renders the American people, none is more important than the domestic and international transmission of press material. In this day of grave U.S. responsibility in world affairs, when explosive events occur, even though they occur oceans away, we must know immediately.

For the sake of national defense and for the sake of speedy and intelligent American action in world affairs, the news must get through. This article is a look at members of the U.S. Communications industry and at the ways in which, to keep Americans informed, they perform the vitally important job of transmitting domestic and international press.

Major Communications Systems

Probably the leading entity in the field of supplying international news channels which feed our newspapers, magazines and radio stations is Press Wireless, Inc., which has thirteen offices throughout the world and serves sixty-four countries for the purpose of international transmission. Other major communications systems serving this field are Western Union International Communications, R C A Communications, Mackay Radio and Telegraph Company and the Bell System. Tropical Radio Telegraph Co. serves between the U.S. and Central America.

Press Wireless, Inc., came into existence thirty years ago when U.S. publishers decided they needed a system to handle press material only. Its purpose is to insure low rates and speedy transmission.

PREWI, as it is known in the communications world, provides transmitting and receiving facilities for the handling of radio-printer, radio facsimile, radio telegraph, radio photo and broadcast operations. It handles close to a million words a day, about seventy percent of all press traffic to and from the United States.

The services of PREWI center around radio transmitters and receivers on the East and West Coasts of this country. Thirty-five transmitters at Hicksville, N.Y., and ten at Belmont, Calif., beam press messages overseas with power ranging from two and one-half to fifty kilowatts. Large receiving stations at Baldwin, N.Y., and Napa, Calif., pick up Press Wireless foreign signals and distribute the new material to American publications. A new Eastern transmission center is planned at Centereach, N.Y., which will occupy five hundred acres and cost $750,000.

Rapid Message Transmission

The larger press services have what might be termed leased wire service in the operation of two-way radio or cable circuits between the United States, Europe and the Far East. They can transmit a message in a matter of minutes and receive replies just as quickly. Their operations are from their own offices without any manual relays to slow down the traffic.

Press Wireless also performs extensive information transmission services by voice and radioteletype for the United Nations, Voice of America, Radio Free Europe and other similar agencies in Europe, Latin America and the Far East.

Radio Relay System

An important installation in the Press Wireless system is the radio relay station in Montevideo, Uruguay, which provides reliable international service during recurring cycles of atmospheric disturbance. Since North-South signals are subject to much less disturbance from "sun-spots" than East-West signals, messages relayed from New York through Montevideo to London often receive better than those sent directly, even though the distance is much greater.

Press Wireless during World War II served the press correspondents with mobile radio communication units in the combat area. Four days after D-Day, Press Wireless began operation of the first mobile unit in the field and no other communications system of any Allied Nation

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furnished this service until some time later.

Service to the U. N.

Another organization important in the transmission of world news is, of course, Western Union International Communications. Western Union transatlantic cables, their word capacity greatly increased by the use of submerged cable repeaters, provide vital service in the handling of international press, especially when "big" stories break.

In the United Nations Building in New York, Western Union maintains an office which is for the use of members of the press and United Nations personnel only. Last November, when the clouds of war hung over the world, while the General Assembly worked late into the night to restore peace in the Middle East, through the United Nations office of Western Union alone, newsmen dispatched a million words of telegraph and cable copy to all parts of the world.

But it is in the field of domestic press that Western Union's partnership with the Fourth Estate is most pronounced. A 24,000 mile nationwide press-wire network for the exclusive handling of news stories is Western Union's contribution in this partnership.

With key centers in New York, Chicago and San Francisco, the Western Union press-wire covers the entire country through thirty-three major news telegraph points. It has more than tripled the speed of former methods of news transmission stories travelling from origin to destination in an average of fifteen minutes. Nearly all newspapers in the U.S. are equipped with Western Union direct wires and page printers automatically receiving news stories from their bureaus and correspondents in this country and abroad. Millions of news words daily are handled over the Western Union system with no manual retransmission from origin to destination.

Telegraph Throughout the World

One Western Union new institution which cannot go unmentioned is Carroll S. Linkins, Western Union's "White House man." In gratitude for his years of service to them, White House correspondents have named after him the railroad car in which they travel on Presidential campaigns.

RCA Communications, Inc., has performed many notable services for the press in the field of international radio broadcasting. As part of its regular operations, RCA Communications provides press telegraph service to all parts of the globe. Its particular contribution to worldwide news coverage has been most pronounced when stories have broken in out-of-the-way places.

Typical Accomplishments

Typical of the accomplishments of RCA in this area were the mobile radio stations which saw service in the ETO during World War II. Using high frequency transmitters and receivers installed in vans, these mobile stations, keeping up with the Allied advance, provided correspondents with a means of filing their dispatches to the United States when cable heads and land line facilities in the battle area were destroyed.

Another service to the press, in which RCA has excelled, is the reception and processing of radiophotos. RCA maintains facilities for receiving press radiophotos from more than forty foreign countries. In 1954 RCA fed radiophotos of the coronation of Queen Elizabeth to NBC-TV for nationwide broadcasting in this country less than nine minutes after the pictures were taken in London.

Presscasts Over the Globe

Despite its corporate relationship with the National Broadcasting Company, RCA Communications provides all broadcasters with international program facilities, and more than seventy-five percent of all overseas programs heard in the United States are received by RCA. The RCA transmitting and receiving facilities for transatlantic communications are at the eastern end of Long Island. Service to the Pacific area is provided through a terminal at San Francisco.

The Mackay service, used by Press Associations, "presscasts" to more than a hundred places on all continents, transmitting well in excess of a quarter million words a day. The Press Associations directly key Mackay's transmitters located at New York, San Francisco and Tangier, Morocco; the later being an important automatic relay station. Charges are established on a transmitter-hour basis.

Many points receive the same copy —especially edited for their particular area and in the language required. Considering wide area azimuthal and path length differences, two and sometimes three different frequencies are keyed simultaneously. In other cases, and in the interest of conserving radio frequency spectrum, two or three transmitters are keyed simultaneously on the same frequency.

Mackay's presscast service is a "blind transmission" service. The receivers are often unattended and out of reach of technical personnel. This, notwithstanding, an analysis of results in one service showed that all receiving points produced an aggregate net yield of ninety-five percent useable copy. One client used Mackay's transmissions for "radioteletypewriter" service, automatically to set type ready for publication.

During World War II, Mackay established a press station at Algiers, and in addition, using mobile radio equipment, provided direct press service to New York for war correspondents attached to General Patton's U.S. 3rd Army and other ETO units.

Transatlantic Cable

The facilities of the Bell Telephone System serve some 11,000 press outlets in this country. The principal users are the major Press Associations. Bell Companies lease teletype lines and station equipment to these organizations as well as circuits for the transmission of photos.

The telephone itself, of course, is an important method of transmission for foreign press material. In most countries and territories—well over a hundred of them—telephone transmission is by radio.

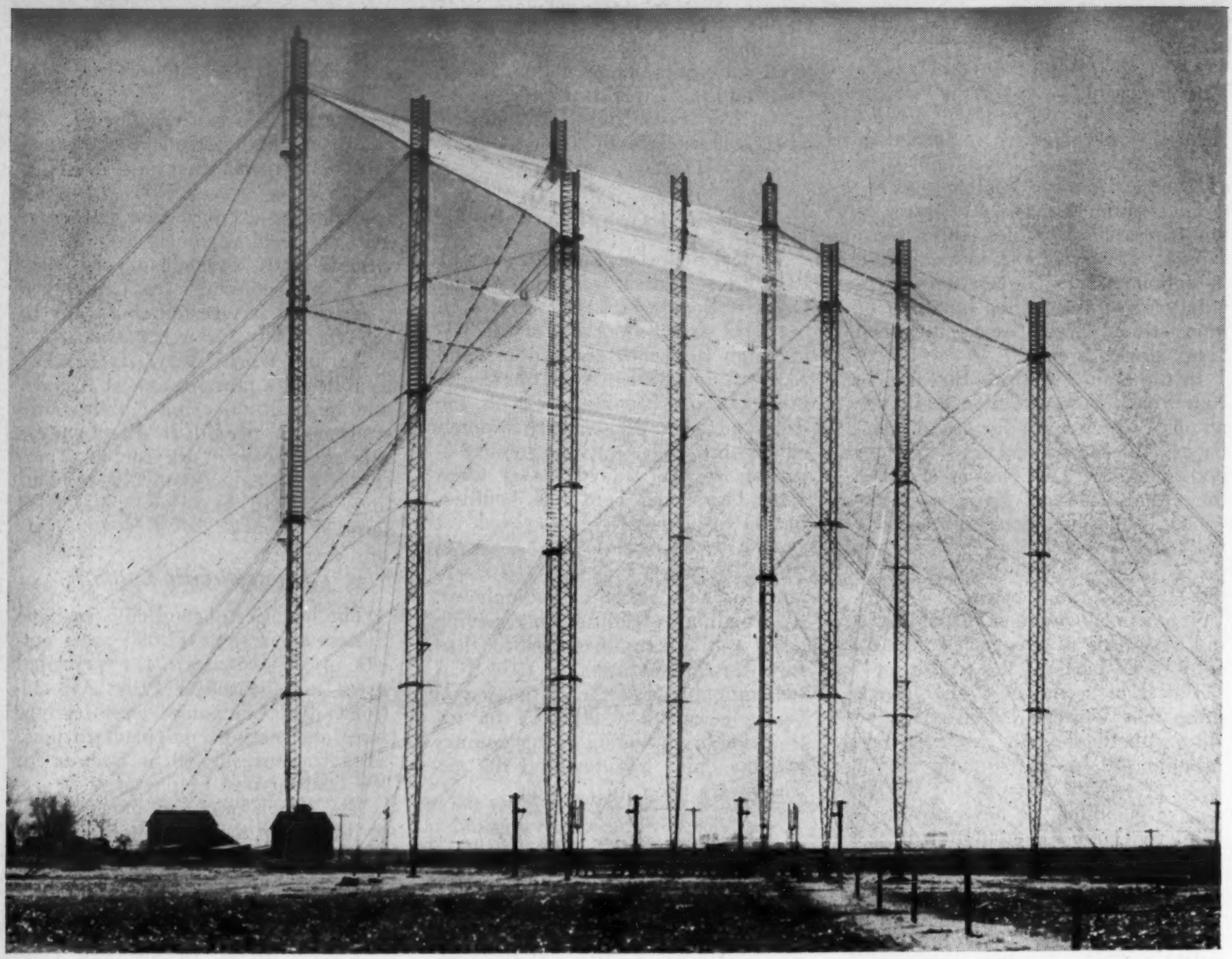
But to Great Britain and eight other countries on the Continent, press voice transmission is often over the new transatlantic cable. British newspapers, in particular, make great use of the cable, daily dispatching stories from New York.

Communications Serves the Press

The new cable to Alaska which runs along the Pacific Coast has encouraged press usage. A valuable aid to press coverage will be the new cable to Hawaii which is soon to come.

Millions of words carried daily—that is the service the communications industry performs for the press. Using cable and radio in all their forms, the U.S. communications systems provide the press with direct service from its own offices to keep the news flowing, both domestic and overseas.

In these days of uncertainty in world affairs, it is paramount that the word is passed. Serving the press, the communications industry is leaving no stone unturned to see that the function is accomplished.



High-gain corner-reflector antenna, designed, installed and test-operated by PAGE for Western Electric Company, under subcontract for DEW-Line project.

PAGE Communications Engineers, Inc. welcomes the members and guests of the Armed Forces Communications & Electronics Association to this significant gathering, and cordially invites you to meet with members of our organization while you are attending the AFCEA convention. Our work is internationally known and of increasing interest and significance. During the past seven years as pioneers in the design, construction, testing and operation of scatter and other advanced radio communications systems, PAGE has played responsible and challenging roles in the building of multi-million dollar telecommunications networks.

Members of our organization are working closely with representatives of the U. S. and foreign governments and industries in the development of such systems. Challenging assignments take our engineers to many corners of the globe.

Due to the increased demand for PAGE-designed, installed, tested and operated systems, we now offer a few exceptionally interesting positions in our Washington, D. C. office as well as overseas.

Engineers who elect to locate in the Washington, D. C. area will find it offers outstanding educational, cultural and recreational facilities. As a center of Government-sponsored enginering and research laboratories, it is particularly attractive to the engineer intent upon pursuing advanced studies. Urban and suburban housing is readily available in all price ranges and easily accessible to PAGE's main offices in the heart of downtown Washington.

Stop by and visit us at Booth #96 or write for further details to:
Mr. J. P. Gaines

PAGE COMMUNICATIONS ENGINEERS, INC.

710 FOURTEENTH STREET N.W., WASHINGTON 5, D. C.

Branch Offices: Seattle, Manila, P. I., Oxfordshire, England.

Affiliates: Rixon Electronics, Inc., Page, Creutz, Steel & Waldschmitt, Inc.

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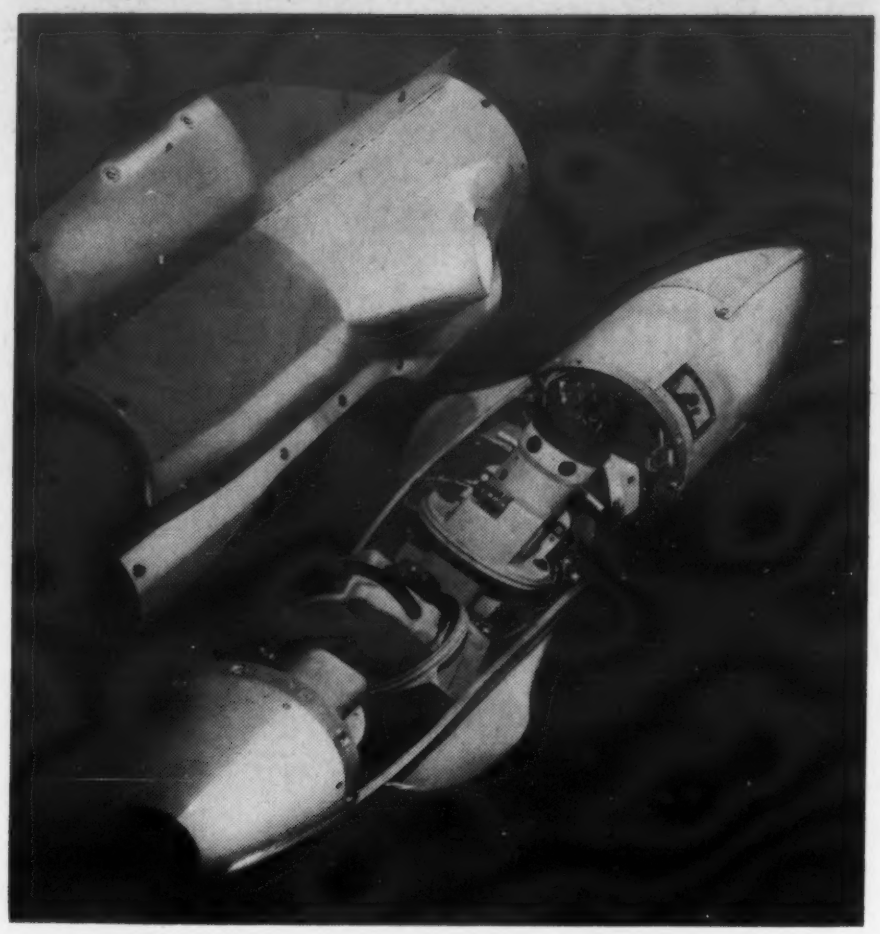
Electronics & Communications Engineers:

Sixty-foot paraboloidal-reflector antenna, typical of those tested and operated by PAGE for Lincoln Laboratory, M.I.T.

PAGE HAS DESIGNED AND CONSTRUCTED

9,000 MILES of scatter communication circuits since 1951

Page has worked with Lincoln Laboratory, M. I. T., the National Bureau of Standards, and the Western Electric Company in the development, or installation and operation, of 10,000 additional miles of scatter communications circuits. Current contracts call for 78,000 miles of new circuits. A pioneer effort unmatched by any other organization.



Bell & Howell Missile Scoring Pod with cover removed to permit removal and loading of its four 16mm high-speed motion picture cameras.

photoprogress

by FRANK SMITH
PHOTO EDITOR
SIGNAL

Missile-Scoring Camera Pod

Something new in photographic instrumentation is a new missile-scoring camera "pod" for determining how and why a guided missile hits or misses its aerial target. It is being manufactured by Bell & Howell, 7100 McCormick Road, Chicago 45, Ill. under U. S. Navy contract.

Since missile and target both fly at velocities approaching the speed of sound and at altitudes far beyond the range of human vision, a remotely controlled system of recording data is a vital tool in evaluating missile accuracy. The new Bell & Howell scoring system furnishes this data on motion picture film.

Mounted on the wing-tips of a drone target, each missile-scoring pod contains four 16mm high-speed Bell & Howell motion picture cameras, electrically operated. The eight cameras—four to a pod, with one pod on each wing tip—are mounted to give complete spherical coverage of a missile's flight as it nears the moving target. The cameras are so aimed that the approaching missile is always covered by no fewer than two cameras. As it passes out of the viewing field of two cameras, it automatically enters the field of two more. An important new feature of this scoring system is its economy factor of up to 300 percent. The 200-foot film capacity of each Bell & Howell camera is sufficient to cover as many as four missile passes at the moving target, with 10-second remotely controlled motion picture "bursts."

Actual scoring of missile behavior is done by assessing the film records against suitable grid coordinate charts. Data thus obtained show the missile trajectory, miss-distances, and other functional characteristics.

The cameras are watertight, interchangeable, and fitted with 142-degree wide angle lenses. Operating speed is 200 fps, exposure time 1/600 second per frame of film.

If there is a direct hit, the camera pods are jettisoned without damage by means of an explosive bolt or "squib." Once free of the drone, the pods are lowered to earth by means of self-contained 16-foot parachutes.

Access doors permit reloading or replacement of cameras without removing the pods from the wing-tips of the drone. Streamlined design and aluminum "skin" are among the pods structural features. Each pod weighs approximately 90 lbs. ready for use, the separate drone-mounted electrical control gear weighing around 35 lbs.

The cameras are designed for operation between 5,000 and 50,000 feet, at velocities up to mach 0.95.

A New Fast Extreme Wide-Angle Lens for Photographic Instrumentation

A new development in the way of fast extreme wide-angle lenses for photographic instrumentation has been announced by Traid Corp., Encino, Calif.

Named the Traid 720, the new lens is claimed to be the most compact 3.45mm f/1.5 wide-angle lens that is available in the photographic instrumentation field. The lens covers an area 160 degrees both horizontally and vertically and is available either in a Gun Camera (GSAP) or "C" mount.

Still Picture Cameras, Wide Angle and Otherwise

Those of our readers who are interested in ultra-wide angle photography will doubtless be pleased to know some of the details about the new whole Sky Cloud Camera developed by Dr. William S. von Arx of the Woods Hole Oceanographic Institution, Woods Hole, Mass., which photographs the entire sky, the horizon and the earth's surface 30 degrees below the horizon.

The field compressor is a parabolic mirror 16-inches in diameter, 3.75 inches focal length mounted with the vertex upward. A modified Kodak-100 16mm time-lapse camera is cycled at the rate of once each minute and mounted 36 inches above the field compressor mirror. The camera requires winding once each day but is triggered automatically by a six-volt timing motor. The motor is turned on by the light of the sunrise, and shuts off automatically at dusk. Film consumption (color) is about 100 feet/week. Surrounding the field compressor mirror are various instruments such as a clock, compass, aneroid barometer, anemometer dial, dry bulb thermometer and wet bulb anemometer, which show the various data on the film at the time of exposure.

Another newcomer to the wide angle camera field is the all-metal Panoram 120 still picture camera of Burke & James, Inc., 321 S. Wabash Ave., Chicago 4, Ill.

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Custom built of aluminum, the camera is much lighter in weight than other wide view cameras and is available in two models. Specifications of the Panoram 120 Mark I Camera are as follows:

Four exposures, 2¼" x 7" on one roll of standard 120 film.
Single speed louver type shutter—1/100 sec. only.
Five-inch (5") Ross lens, fixed focus.
Extreme wide angle view.
Wire frame finder, ground glass back.
Weight 9 lbs.
Dimensions 4½" high x 10" wide x 8¼" deep.
Detachable ground glass back and two detachable magazines included.
Double bubble level.
Price of the Mark I is $169.50. The Panoram 120 Mark II is the same as the Mark I but in addition has focusing mount and X Flash Synchronization. Price of the Mark II is $199.50.

Terrain Scanning System for Electronic Photogrammetry

A new and revolutionary system which scans the ground photoelectrically and automatically producing a corrected orthographic photomap is described in an illustrated technical paper by Ross E. Williams and Paul Rosenberg in the Dec. 1956 issue of "Photogrammetric Engineering" (pp. 823-830).

The system described is unique in that no photographic processes are used to gather the terrain information. In operation, the varying light intensities which are gathered by the aircraft scanning components are converted to video signals by photomultiplier tubes and stored in magnetic tape, which takes the place of photographic film in conventional mapping.

After the signals are stored in the tape, it may be re-run and the signals are automatically oriented. The signals may then be used to print a corrected photomap, carve a relief model or produce a map manuscript.

The authors state that the principal advantages of the system as presently conceived are: the mapping operation can be conducted at high speed; operation of the system is automatic except for the photo interpretation part; the system is operable, under some conditions at lower levels of ground illumination than in conventional aerial photography; photographic processes are not used and the system is not affected by radioactivity; the size and weight of the aerial components, including the magnetic tape, are practical for aerial aircraft installation.

Kodak New Retina Single-Lens Reflex Camera

A new 35mm camera, that extends the Kodak Retina line of miniature cameras into the automatic single-lens reflex field, has been announced by the Eastman Kodak Co., Rochester, N. Y.

The camera, which is tentatively scheduled to be available in the Fall of 1957, provides true single-lens reflex viewing with 24 x 36mm ground glass as well as range finder focusing.

A penta prism-type view finder, combined with an extra-fine grained ground glass, permits the photographer to sight and focus directly through the 50mm f/2 Retina Xenon C lens or through wide-angle or telephoto lenses, even when supplemented by close-up attachments. The view finder shows exactly what will be recorded on film, parallax-free, correct from left to right and in full negative size.

The camera is equipped with Synchro-Compur Shutter with internally linked exposure value setting, pre-set automatic diaphragm and self-timer. It is fully flash synchronized for X and M type light sources with safety-lock setting lever. Shutter speeds range from 1/500 second to "B." The tentative list price of the camera is $220.00.

Xeroradiography

Although the word xeroradiography is rather long and formidable, the process fortunately is not. If anything it is a simplification and means merely the adaptation of the now well-known xerography process to x-ray work.

With the commercial introduction of xeroradiography, quality control on an economical, production-line basis is possible. There are three methods of utilizing this new tool: (1) the image can be viewed directly on the original plate, (2) a film record can be made by photographing the plate, (3) a permanent paper "print" can be made directly from the plate. All three methods are fast and permit corrective measures before a large number of defective parts have been processed.

The plates are reusable indefinitely and cost less than half that of conventional film. No darkroom is required and all operations are performed in the light. No solutions, liquid chemicals, tanks, plumbing, etc., are required since the process is entirely dry.

In operation, an aluminum plate, coated with photosensitive selenium, receives a positive charge which is lost when exposed to x-rays. The x-rays penetrate the specimen as in conventional radiography. The charge on the plate "leaks" away proportionally to the degree of x-radiation. A negatively charged powder adheres to a positively charged area. Density of the powder varies with amount of charge. The image can then be viewed directly, copied on film or transferred to paper. A print can be made by pressing a special paper on a plate by rollers. Powder from the plate is transferred, giving a positive image which is fixed permanently by applying heat. The plate then may be cleaned for reuse.

The X-ray Dept., General Electric Co., Milwaukee 1, Wisc., are manufacturers of this equipment from whom additional information may be obtained.

New Developments in 16mm Motion Picture Camera Equipments

Enthusiasts of underwater photography will doubtless be pleased to learn of a new Bolex underwater camera available from Paillard Products, 100 Sixth Ave., New York 13, N. Y.

Designed to hold any Bolex H-16 16mm motion picture camera, the case is operable at depths down to 330 feet. The camera can be completely operated from the outside while under water since all essential controls are provided for, including winding, diaphragm setting, and shutter release. The footage counter is visible from the outside. Viewing is done through a parallax corrected gunsight located on the side of the case.

The shutter release can be locked to prevent accidental operation of the camera. Provision is made for a retaining strap on both handles and a lighting unit on the bottom of the case. The case is supplied with a filter to increase the picture contrast in black-and-white filming.

The case is calibrated for any Kern Paillard wide angle lens—Switar 10mm f/1.6, Switar 16mm f/1.8 and Yvar 16mm f/2.8. The Switar 10mm is especially recommended for underwater filming because of the high speed and wide field of view. The case is not calibrated for other make lenses. Retail price of the Bolex Underwater

(*Continued on page* 105)

New KAY Vari-Sweep

MODEL IF

CAT. NO. 866

A Complete Alignment Instrument 4-120 mc

Sweeping Oscillator • Calibrated Variable-Frequency Oscillator Fixed Crystal-Controlled Markers

The *VARI-SWEEP MODEL IF* retains the advantages of the standard fixed-band alignment unit and adds features which make it a flexible, "universal" laboratory instrument.

1. **It provides for continuously variable center frequency from 4-120 mc with a direct reading, individually calibrated frequency dial.**
2. **It provides for continuously variable sweep widths from kilocycles up to as much as 40 mc.**
3. **It provides a continuously variable frequency marker from 2 to 135 mc, with a separate direct reading, individually calibrated frequency dial. This is a pip type marker combined with the sweeping oscillator output within the unit. No external coupling is required.**

DESCRIPTION

The sweeping oscillator is an all electronic unit, utilizing variable permeability techniques and operates throughout on fundamental frequency. It provides frequency sweeps, which are flat, wide and linear, and generates enough output voltage (1.0 volt rms into 70 ohms or 50 ohms) to permit the testing of lossy networks without the use of additional amplifiers. The usual errors introduced by broad-band amplifiers can thus be eliminated. The high output also permits the use of adequate padding in applications requiring the feeding of two or more paths. The RF output over the entire range is held constant by a fast acting AGC circuit, maintaining flatness within ± 0.5 db over widest sweep and over tuning range.

The sweeping oscillator covers the band in six, switched, overlapping bands with a direct reading, individually calibrated frequency dial.

For frequencies below 50 mc, the sweep width is continuously variable to at least 60% of the center frequency; above 50 mc, the maximum width is at least 30 mc.

To eliminate the necessity for phasing adjustments, a linear sawtooth voltage, synchronized with the sweeping output, is provided as a horizontal deflection voltage for the scope. The repetition rate of the sweep may be locked to the nominal 60 cps line voltage; or, for hum detection and other tests, varied around this frequency. To insure an accurate, zero voltage reference line on the scope, the sweeping output is blanked during the scope retrace period. The crystal marker circuits utilize quartz crystal filters in producing sharp, stable, pulse-type markers accurate to within ± 0.05% which are fed separately to the scope. The markers are completely isolated from the RF circuits under test and will appear on traps and on sharp slopes and skirts. Up to eleven markers may be selected, usable one at a time or in combination.

The variable marker is generated by a separate CW oscillator, which operates at fundamental frequency and covers the range from 2 to 135 mc in six overlapping bands. A separate individually calibrated, direct reading frequency dial is accurate to ± 1%. The variable marker is a "birdie pip" type of marker easily distinguishable from the fixed pulse-type marks. It is available at the same panel terminals as the fixed markers. A separate level control is provided for adjusting the size of the variable marker. All coupling is provided within the unit, the variable marker is completely isolated from the RF circuits under test.

SPECIFICATIONS

FREQUENCY RANGE: 4 to 120 mc, center frequency in six overlapping bands. Fundamental frequency. Direct reading frequency dial.

SWEEP WIDTH: Continuously variable to maximum of at least 30 mc (above 50 mc) or 60% of center frequency below 50 mc.

SWEEP RATE: Variable around 60 cps. Locks to line frequency.

RF OUTPUT: 1.0 volt rms into nominal 70 ohms. Output held constant to within ± 0.5 db over widest sweep and over tuning range by AGC circuit.

ATTENUATORS: Switched 20 db, 10 db, and 3 db plus continuously variable 6 db.

ZERO REFERENCE: A true, zero reference line is produced on the oscilloscope during display retrace time.

SWEEP OUTPUT: Regular sawtooth synchronized with sweeping oscillator. Amplitude approx. 7.0 volts peak.

FIXED MARKERS: Up to eleven, pulse-type, crystal-controlled markers at customer specified frequencies. Accurate to ± 0.05 %.

VARIABLE MARKER: "Birdie pip" marker continuously variable from 2 to 135 mc in six switched overlapping bands. Direct reading frequency dial accurate to within ± 1.0%.

MARKER AMPLITUDE: Continuously variable from zero to approx. 5.0 volts.

POWER SUPPLY: Input approx. 180 watts, 117 volts (±10%), 50-60 cps AC. Electronically regulated.

DIMENSIONS: 10½" x 19" rack panel. 12" depth. Suitable for rack mounting. Supplied with cabinet—11½" x 20" x 15".

WEIGHT: Approximately 50 lbs.

PRICE: $950.00 f.o.b. Pine Brook, N. J., including cabinet and full complement of crystal markers.

For literature and complete details regarding other Kay instruments, write:

KAY ELECTRIC COMPANY

Dept. S-5, 14 Maple Avenue, Pine Brook, N. J., CAldwell 6-4000

See us at the Armed Forces Communications & Electronics Convention, May 20-22, Washington, D. C., Booth 46

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case, complete with filter, two diaphragm setting rings and two wrenches, is $600.00.

The other new Bolex item is the H-16 16mm Reflex Motion Picture Camera. The outstanding feature of this camera is the reflex system which makes possible viewing and focusing through the taking lens before and during shooting. The photographer need only look through the eye level view finder to frame his picture, and press the starting button to film. The reflex feature allows the most accurate alignment possible at all distances, with all lenses, and is especially valuable for titling, special effects, extreme close up cinematography, microcinematography, and absolute framing for all shots.

The image is picked up behind the lens in front of the shutter by a semi-reflecting prism, and can then be viewed right side up and six times enlarged from behind the camera through the eye level focus. The eye level focus is equipped with an adjustment for various eyesights. The camera also comes equipped with the standard Octameter view finder for use in those cases where an optical view finder might be more desirable.

The Bolex H-16 Reflex, in addition, is equipped with all the valuable features of the other H-16 models, such as filter slot, automatic threading, full 100 foot rewind, Registrator Claw, frame counter, visible and audible footage counter, etc. Price of the camera with 25 mm Switar f/1.4 lens is $535.00.

Another camera item which is sure to attract a great deal of attention is the new all-purpose instrumentation camera of the Traid Corp., Encino, Calif. Designated as the Traid TN-9 the camera is a modification and adaptation of the standard GSAP Bell & Howell N-9 camera. Three basic designs are offered: the TN-9, standard instrumentation design; TN-9A, automatic exposure control design, and TN-9B, pulse operated interval design. Optional features available on these cameras include: automatic exposure control, strip or streak operation, conversion to slow speeds of 12, 24 and 48 fps, conversion to a single high speed of 100 fps, conversion for use under loads to 100 g's, and conversion for use in scope recording. Timing system, event timer, view finder and correlation output pulse installation are also available.

Accessories now being offered include: 100 ft. and 50 ft. magazines, full range of "C" and GSAP mount lenses, special camera mounts, boresights, remote controls and color film as well as black and white.

Another outstanding new arrival in the 16mm motion picture camera field is the spool-loading 240 series cameras of Bell & Howell, 7100 McCormick Road, Chicago 45, Ill.

The new cameras are available in single-lens and two- and three-lens turret versions and feature automatic film-threading mechanism; a constant-speed easy winding motor producing a long 32-foot spring run; 100-foot film capacity; single-frame; continuous-run lock; and a versatile range of camera speeds including 8, 16, 24, 32 and 48 fps. The camera is of die-cast aluminum construction and is equipped with an adjustable leather hand-strap for steadying the camera during filming. The motor is wound by means of an easy-winding crank which folds back out of the way between windings. The "negator-type" spring affords constant speed throughout the 32-foot run. The "zoom" view finder on the 240A and the 240T models is instantly adjustable to indicate the exact fields covered by lenses having focal lengths from 20mm (about 5/4 inch) to 4 inches. Various lenses, filters and accessories are available.

The Bolex Underwater Camera Case.

New Paxar Aerial Reconnaissance and Spotting Lens

A new aerial reconnaissance and spotting lens, designated the Paxar, has been announced by the Pacific Optical Corp., 120 South Glasgow Ave., Inglewood 1, Calif. The new lens has a focal length of 24" and a relative aperture of f/4. The lens is magnesium fluoride coated and is a 5-element design conforming to Type I MIL-Std-150. The lens covers a format of 9" x 9" and the optical elements are manufactured with Grade A American optical glass. The mount is cast aluminum alloy and the weight of the lens is 20½ lbs.

The World's Fastest Films! In Both Color and Black-and-White

A new and exciting development in the world of color photography has just been announced by Ansco, Binghamton, N. Y. The new color film, called Super Anscochrome, is so color sensitive that it can be used to make color snapshots by the light of an ordinary 40-watt fluorescent tube or by the daylight from an open window.

Super Anscochrome has an ASA Index of 100 with normal processing. This speed may be doubled to 200 by increasing the developing time.

The basic exposure for Super Anscochrome is 1/500 second at f/6.3 as contrasted to 1/50 second at f/6.3 for conventional-type color film.

The extreme speed of the new film will, according to a representative of the company, make it easy to take full color pictures of subjects under conditions where color photography has previously been impossible.

With Super Anscochrome Color Film, photographers will be able to use shutter speeds as high as 1/500 and 1/1000 second to stop movement in even the most rapidly moving subjects. Good pictures will also be possible in extremely unfavorable lighting—even in the rain, if the photographer wishes.

(*Continued on page* 108)

UMI

Air-supported fabric antenna provides front-line support in minutes

One hundred and twenty minutes after the site is selected, high-power radar using a new, extremely portable antenna can be scanning the skies. This revolutionary, lightweight antenna has been developed by Westinghouse Electronics Division for the Rome Air Development Center.

The Paraballoon® antenna is blown up like a balloon! It maintains its shape with only slightly more than atmospheric pressure. Two fiberglass paraboloids—one of which is coated with vaporized aluminum—are zipped together to form the 30-foot antenna. In comparison with equivalent conventional antennas, the Paraballoon has shown weight advantages as much as 10 to 1.

The antenna retains its accurate contour no matter how many times it is erected and dismantled, so no contour checking is required in the field.

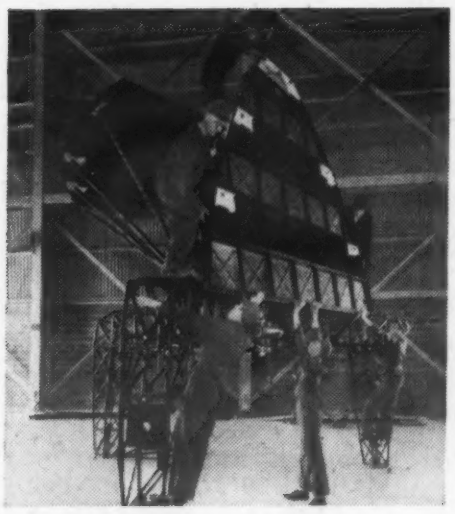
Major General Stuart P. Wright, Commander of Rome Air Development Center states: "This outstanding development is a major break-through in the design of ground electronics equipment. The air-inflated Paraballoon antenna is the key to a large and truly mobile radar set. It is now possible to employ high-power radars in tactical situations and locations where time and transportability are of utmost importance."

Design and development of advanced electronic equipment are only part of the service available to you from Westinghouse. For complete information about Westinghouse capacity to produce tomorrow's electronic equipment today, contact your Westinghouse sales engineer or write: Westinghouse Electric Corporation, Electronics Division, Friendship International Airport, Baltimore, Maryland.

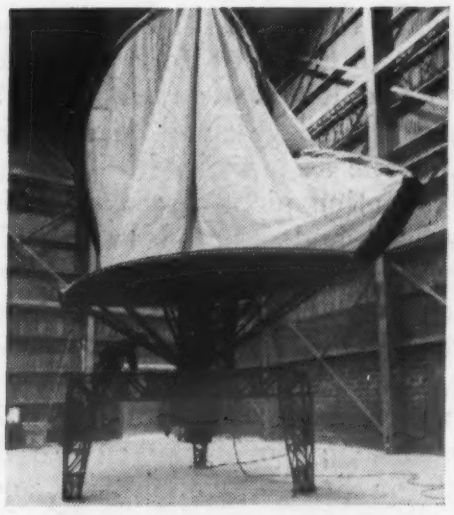
J-02306

YOU CAN BE SURE... IF IT'S Westinghouse

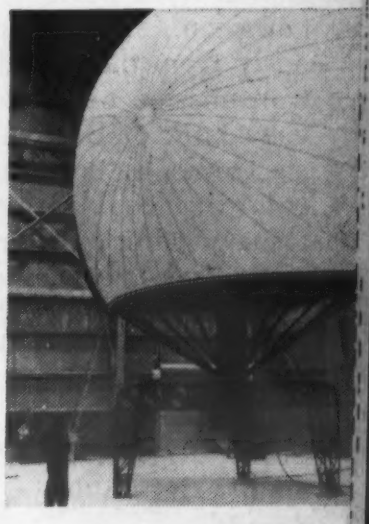
In less than one hour, this small crew can assemble the revolutionary Paraballoon antenna from these few parts. They will place the tripod directly on the ground.



Here, the crew has assembled the antenna tripod. With a block and tackle attached to the radome crown piece, they are positioning the antenna base.



The paraboloids are zipped to a two-ply neoprene-nylon tube. This tube forms a stiff arch—the main structural member of the balloon—which holds the inflated antenna in position.



The 30-foot antenna show here, ready for operatio weighs only 1690 poun complete with its base ar tripod. It will rotate at 6rp driven by a ¼-hp motor.

Initially, the new Super Anscochrome will be supplied in daylight type only, first in 120 size rolls and later in 20 exposure 35mm magazines.

Not to be outdone, at least in the black-and-white field, Eastman Kodak Co. has just announced the fastest film of all—their new Kodak Royal X-Pan. Designed for use by press, commercial and industrial photographers, the new film is panchromatic, Type B (high green, low red). The manufacturers state that the film is four times faster than Kodak Royal X-Pan when both are given equal development. When development of the new film is forced, even higher ASA ratings may be used as a basis for the new film's exposure. Ratings as high as ASA 8,000 have produced easily printable negatives.

The new film is the result of recent discoveries made by Kodak scientists working on emulsion research.

The grain size is said to be somewhat coarser than in Royal Pan but is finer than would be expected for such a large speed increase. Enlargements up to five or six diameters do not show excessive graininess.

Recommended development is in DK-60a, 6 to 10 minutes at 68 degrees Fahr.

Kodak Royal X-Pan Film is available in sizes 2¼ x 3¼, 3¼ x 4¼, 4 x 5, 5 x 7 and 8 x 10 in 25-sheet packages.

With this array of fast films the photographer will certainly be well equipped to get more and more of those "impossible" shots due to poor lighting conditions and other factors.

Electronic Photography

An electronic system that takes, transmits and prints color pictures in seconds was predicted by Dr. Irving Wolff, Vice-President, Research, of Radio Corp. of America, speaking before a recent meeting of the Boston section of the American Institute of Electrical Engineers.

The system would consist of a high-speed chain using television pickup, tape recording and Electrofax Printing Process, and would provide permanent prints of pictures taken less than five seconds earlier at points thousands of miles away.

Dr. Wolff pointed out that techniques now exist for performing all steps in the photographic process by instantaneous electronic means "from exposure to final print, and including the means for storing images in electrical form on magnetic tape."

With such a system, a newsworthy event in New Orleans, San Francisco, Chicago or another city might be viewed by a portable television unit carried by a single newsman. The image would be transmitted instantaneously from the portable unit to a nearby relay point for transmission over a closed circuit or network facilities to New York or Boston, where the image could be recorded electronically on magnetic tape as it arrived. The tape recording could provide a motion picture record for instant viewing or later playback and re-broadcast. At the same time, any single section of the tape, corresponding to a single frame of the television picture, could be played back repeatedly at high speeed to provide a still that could be printed electronically on paper directly from a special type of television picture tube. In this case, the entire process, from exposure in the distant city to the final print in New York or Boston, would take some seconds.

Dr. Wolff stated that the major elements of such a system already exist in basic form as follows: (1) a compact, light-weight television camera, employing a new ½-inch Vidicon pickup tube and transistorized circuits. While present developmental types are designed for black-and-white television, he stated that portable color cameras incorporating these small components "are certain to appear in the near future;" (2) a magnetic tape system for color television, which makes possible the recording of color or black-and-white signals for immediate or later playback; (3) the R.C.A. "Electrofax" process of high-speed, direct printing by electronic means. Dr. Wolff pointed out that progress will be made in adding color to the "Electrofax" process to achieve color prints on paper. "These comprise all of the elements of a photographic system," said Dr. Wolff. "However, a system employing these electronic steps would be totally novel in its over-all ability to handle motion and color, and to transmit visual information instantly to remote points for high-speed recording."

Stanford Research Institute High-Speed TV Office Duplicator

An interesting combination of electrophotography and television is disclosed in a recent announcement by the Stanford Research Institute of Menlo Park, Calif. Briefly, the announcement concerns an instrument which is essentially a high-speed office duplicating machine which employs a closed circuit TV network and electrophotography for the reproduction of documents.

The system consists of a transmitter-printer-unit in which the printer, if desired, can be located remotely from the transmitter. The system as designed occupies about the same amount of office space as current office duplicating machines. This is important from the standpoint of mobility and because in most offices, space is likely to be at a premium. In this system, copies are printed directly from the original documents and there is no need for stencils as is required in most office duplicating machines.

At present, the system can duplicate line drawings and the possibility exists, that with further refinements, it can reproduce photographs as well.

In operation, a spot of light 0.006-inch wide scans the document to be reproduced. The light is flashed from left to right across the document at approximately one inch per 30 microseconds. In ⅓ second a total of 17,000 successive beams sweep horizontally across the surface of the sheet.

The scanner receives light reflected from the copy (video signal) and transmits it through a coaxial cable to the receiver, where it is amplified, and then applied to the grid of the cathode ray tube. Immediately, a small electric charge is deposited by means of a wire array in the tube faceplate onto the copy paper. After 17,000 successive scannings, a sufficient number of electrically charged dots is deposited on the paper to form a latent electrostatic image.

As the copy paper is fed past the faceplate, it is dusted with black powder which clings to the charges on the paper's surface and makes the latent (electrostatic) image visible. The powder is then heated and pressed into the paper to form a permanent record.

Conventional TV cameras have been found unadaptable for this system. To fill the gap, the Institute is developing a special camera to transmit a signal of the sharpness desired in reproduced copies.

At the present stage of development, the machine prints the text from a 35-mm film onto a ¾-inch wide tape. Proposed equipment modifications will enable duplication on 8½ x 11-inch sheets of paper.

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Association affairs

SPECIAL APPRECIATION

We wish to express our appreciation to Mr. William Robinette and Mr. Lynn Anderson of Washington, D. C., Mr. John Ferguson, Monumental Printing Co. of Baltimore, Md., and Wm. C. Copp & Associates, N. Y., for their help and assistance with the 1957 AFCEA Convention.

Special recognition is due the following committee chairmen:

Social Committee—John Gilbarte; Ladies Program—Mrs. Frances Engel; Publicity—Roland Davies; Technical Sessions—Francis Engel, and Transportation & Tours — George Sheets.

HONOR GRADUATE AWARDS

Honor graduates at the Signal School, Fort Monmouth, N. J. were recently presented with the AFCEA Award for outstanding scholastic achievement.

Five of the officers were enrolled in the Signal Officers Basic Course. They were:

Section 724 — Second Lieutenant Leland C. White of Rabb Road, La Feria, Texas, who is a graduate of Texas A & M College.

Section 725 — Second Lieutenant Lynn W. Craig of 2208 Laurel Ave., Knoxville, Tenn. He studied engineering at the University of Tennessee.

Section 726 — Second Lieutenant Frank S. Young, 2022 Aldo Circle, Salt Lake City, Utah. He studied at Stanford University.

Section 727 — Second Lieutenant Carleton K. Sherman, 3300 Wentwood, Dallas 25, Texas, who studied at Agricultural and Mechanical College of Texas.

Section 728 — Second Lieutenant Fred L. Adams, 47 East Third St., Morrestown, N. J., a graduate of Rutgers University.

Second Lieutenant Harry S. White, Jr. of 108 North Pike St., Grafton, West Va., and a graduate of West Virginia University, scored highest academically in the Signal Supply Officer Course, Section 931.

In the Microwave Radio Officer Course, Second Lieutenant David W. Klinge of 1503 Stoughtin Ave., Tomah, Wisc., took the number one spot. Lt. Klinge studied at Purdue University.

Introducing AFCEA's New Group Member

The AFCEA welcomed Hallamore Electronics Co., of Anaheim, Calif., as a group member in March. Hallamore is a relatively new company, intensively engaged in military contract work.

The members of the firm who will be company representatives in AFCEA are: L. G. Hallamore, President; P. Eastman, Assistant Vice President; Leo Johnson, T. Prouty, C. L. Ambler, D. McCray, J. Carl, R. F. Bruce and E. E. Eiler, all Supervisors, and John J. Burke, Vice President in Engineering.

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Communications—Electronics—Photography

Listed below are the firms who are group members of the Armed Forces Communications and Electronics Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCEA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

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Automatic Telephone & Electric Co., Ltd.
Barker & Williamson, Inc.
Barry Controls, Inc.
Bell & Gossett Co.
Bell Telephone Company of Pa.
Bell Telephone Laboratories, Inc.
Bendix Radio Division, Bendix Aviation Corp.
Berkshire Transformer Corp.
Blackburn Electronic Corp.
Bliley Electric Co.
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Elgin Metalformers Corp.
Fairchild Camera & Instrument Corp.
Farnsworth Electronics Co.
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Federal Telephone & Radio Co.
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General Cable Corp.
General Communications Co.
General Electric Co.
General Telephone Corp.
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Hallicrafters Co.
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Heinemann Electric Co.
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Kleinschmidt Laboratories, Inc.
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Koiled Kords, Inc.
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Lenkurt Electric Co.
Lenz Electric Manufacturing Co.
Lewyt Manufacturing Corp.
Librascope, Inc.
Loral Electronics Corp.
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Magnavox Co.
Maida Development Co.
Mallory, P. R., & Co., Inc.
Materiel Telephonique Co.
Merit Coil and Transformer Corp.
Michigan Bell Telephone Co.
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Montgomery Co., The
Motorola, Inc.
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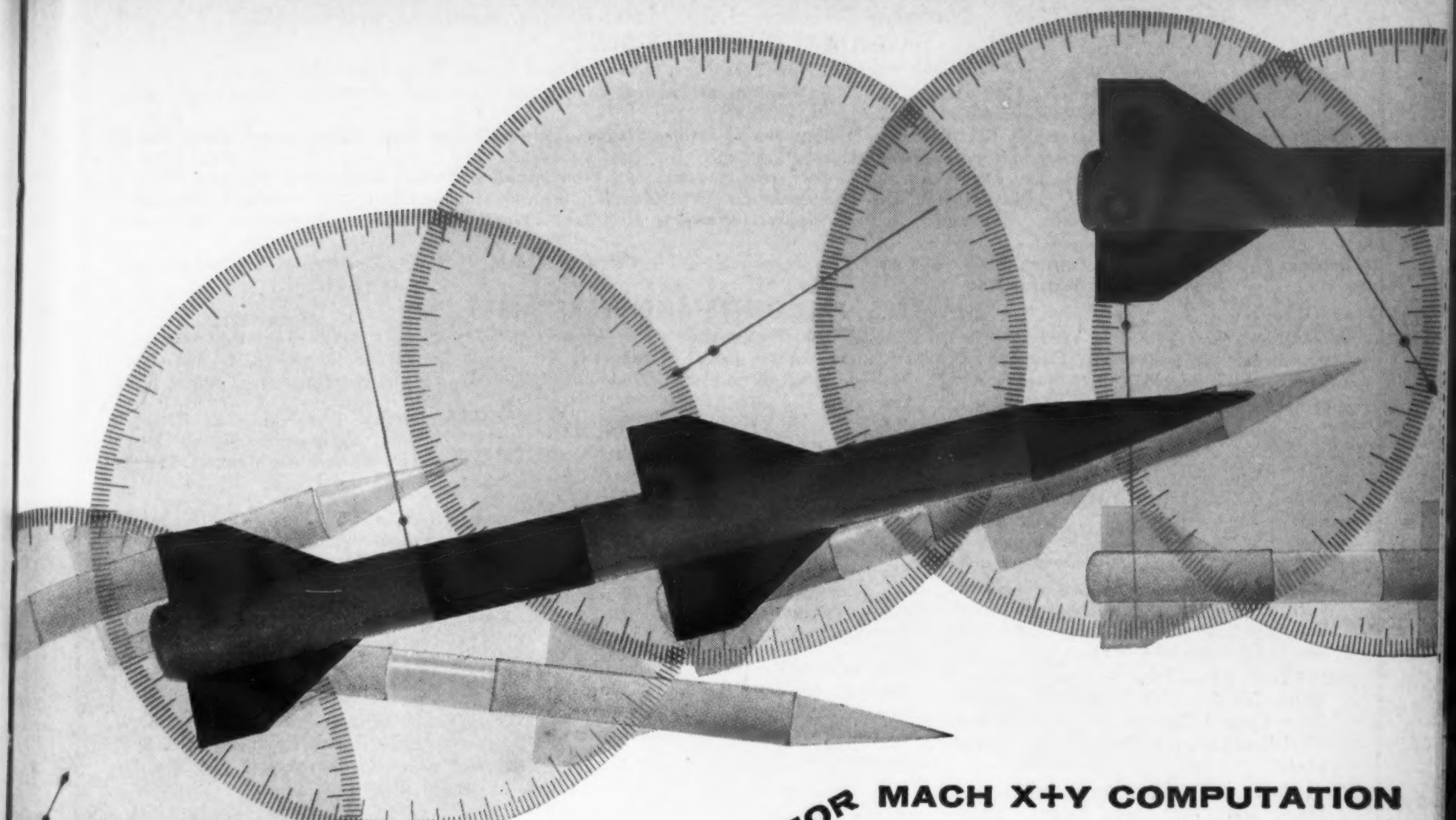

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TOKYO: Pres.—James T. Ramsey, Hq. FEAF ,Box 228, APO 925, S. F. Sec.—Paul W Becker, SigO, AFFE-8A Rear, APO 343, S.F.

WASHINGTON: Pres.—M. C. Richmond, Western Electric Co., 713 Cafritz Bldg., 1625 Eye Street, N. W. Sec.—George Sheets, 712 Cafritz Bldg., 1625 Eye Street, N. W.

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UMI

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Chapter News

Atlanta

Major General James D. O'Connell, Chief Signal Officer of the Army, was guest speaker at the chapter's March 27th dinner-meeting held at the Fort McPherson Officers' Club. The subject of his address was "The Army in the Missile Age."

Citing the chapter and the Association, General O'Connell said: "I particularly welcome this opportunity to come here and talk to the Atlanta Chapter. This chapter, only nine years old, and with its over two-hundred members, has had a very vigorous growth. It is the up-to-date model of a parent organization that goes back almost 100 years. The vision, imagination and activity going on here is the happy result of this century of success. Up through the years, men of energy and drive have served this organization by giving freely of their vision and talent."

With "The Army in the Missile Age" as his topic, the General stated: "Your Army is well into the age of missiles. Key cities throughout the United States are being guarded by missiles tonight. Other Army missiles capable of carrying either atomic or high-explosive warheads are deployed with our troops in Europe and in the Far East. . . .

"The forward thinking in today's Army is not characterized by missiles alone. I might say that missiles are, in a dramatic way, symbolic of our continued emphasis on maintaining superiority over our potential enemies. We must have superior weapons to give us maximum deterrent effect and to leave no doubt in the Communist mind that he will be faced at all points by greater technical skill, productive capacity and determination than he can possibly muster."

Atlanta—Maj. Gen. James D. O'Connell, Chief Signal Officer of the Army, who addressed the March meeting, is shown with Chapter President Charles M. Eberhart and Maj. F. E. Warehime, Jr., of the Air Defense Command, Georgia Coordinator, Ground Observer Corps.

General O'Connell illustrated his talk with films of various new types of equipment which the Army has or which are being developed.

Baltimore

A tour of the Maryland Air National Guard Headquarters at Harbor Field featured the chapter's February 26th meeting. Major J. Considine was host for the occasion.

During the tour, the chapter members and guests visited the briefiing room, the maintenance shop, and inspected a C-47 and its modern aircraft communications system.

The group also were shown a film on the AACS, covering the development of air waves and air communications systems throughout the world, and "It's Your Decision," an animated film on the Armed Forces Industry Defense System, portraying the part industry plays in national defense.

On March 19th, a dinner-meeting was held at the Chesapeake and Potomac Telephone Company. Mr. Robert B. Alexander, Assistant Projects Manager, Engineering, Project 572, Defense Projects Division of the Western Electric Company, was the principal speaker.

Mr. Alexander discussed the DEW Line Project, with which he has been closely associated for the past two years, and showed a color film which gave a vivid portrayal of the problems encountered and solved in the construction of this radar net.

At the conclusion of the program, Mrs. Barkdoll, Chesapeake & Potomac Telephone Company hostess for the evening, conducted a tour of the telephone switchboards and a home planning center display.

Arizona—Shown during a recent meeting are, left to right: Maj. Gen. Emil Lenzner, Commanding General, USAEPG, Fort Huachuca; Col. Kirk Buchak, chapter president; and Dr. H. R. J. Grosch, computer division, General Electric Company, the principal speaker.

Boston

Meeting at the Harvard College Observatory on March 28th, the chapter heard a trio of experts from the Smithsonian Astrophysical Observatory in Cambridge tell how to watch and take pictures of a 20-inch satellite 300–1000 miles away as it races around the world at speeds faster than 18,500 miles per hour. The speakers also disclosed progress in coordinating 1500 volunteer astronomer watchers as they partake in the "Operation Moonwatch" phase of the satellite program.

Heading the speakers was Dr. Fred L. Whipple, director of the Observatory, who spoke on "The United States International Geophysical Year Earth Satellite Program." Assisting him were

UMI

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Boston—Dr. Fred L. Whipple, director, Smithsonian Astrophysical Observatory, holds model of designed camera-telescope to be used during IGY and which illustrated his talk at the March meeting. Looking on, left to right, are: Fred E. Moran, chapter president; Dr. Don A. Lautman of the Observatory; and Capt. A. R. Taylor, program chairman.

Dr. J. Allen Hynek on "Communication Requirements for the Satellite Station Network," and Dr. Don A. Lautman who reviewed "Computing for the IGY Satellite."

A major problem facing the Observatory in its quest to photograph the hurtling sphere will be how to pinpoint its position in time and space. More than 70 teams in the United States will try to glimpse the image as it streaks across the country in less than 10 minutes.

Data from these teams, as well as from 30–50 more stationed throughout the globe, will be relayed into central headquarters at Cambridge where an electronic computer will supply predicted satellite positions to be pointed at by special camera-telescopes to be located at 12 sites around the world.

Dr. Whipple, Observatory director, was in charge of developing "Window," a confusion reflector used as a radar countermeasure in World War II. He has received the Donohue Medals for the independent discovery of six new comets, and the J. Lawrence Smith Medal of the National Academy of Sciences for research on meteors in 1949. He is the author of the book, "Earth, Moon and Planets" as well as other papers in these fields.

Dr. Hynek, associate director of the Observatory, is in charge of the earth satellite optical tracking program, and Dr. Lautman is in charge of satellite computations for the Observatory.

Chicago

Mr. W. C. Hasselhorn, President of the Cook Electric Company, was host to the chapter at a meeting held on March 14th at the Lake Shore Club.

Diversified subjects featured the evening's program. The speakers were: Dan Shevelenko, division manager, Diaphlex Division, who discussed color films on switches and relays; Charles Flubacker, technical assistant to the president, "The Morton Grove Technological Center;" George Brown, business manager, Inland Testing Laboratories, "Reliability Testing;" and George C. Payne, field office manager, U.S. Department of Commerce, Chicago, "Commerce Aids to Industry."

A record number of members and guests turned out for the meeting and the social hour and dinner which preceded it.

Fort Monmouth

Dr. R. D. Shelton of the Radiation Physics Department of the Admiral Corporation gave a talk on "The Effects of Nuclear Radiation on Electronic Components" at the chapter's March 26th dinner-meeting at Gibbs Hall Officers' Club.

The component types discussed and presented in color slides of before and after effects, included vacuum tubes, resistors, capacitors and semi-conductor devices. An analysis of the mechanisms of damage was presented with the experimental data.

The meeting was presided over by A. William Christopher of Sylvania Electric Products, Inc., chapter vice president.

Kansas City

Mr. John T. Naylor, president, United Telephone Company of Missouri, addressed the chapter's March 6th dinner-meeting at the Wishbone Restaurant.

Mr. Naylor, who served as president of the Philippine Long Distance Telephone Company from 1950-1956, related some of his experiences in rehabilitating the telephone system in the Philippines following World War II. Included in his presentation were some of the strange customs associated with telephony in some of the Oriental countries.

Korea

The Minister of Communications of the Republic of Korea, Mr. E. J. Lee, was the principal speaker of the chapter's February 21st dinner-meeting at the "Kimchi Copa" Officers' Club of the 304th Signal Battalion. Also in attendance were Mr. H. H. Choi, Vice Minister of Communications, Republic of Korea; Col. S. K. Kim, Chief Signal Officer, ROK Army; Mr. A. J. Allen, advisor to the ROK Ministry of Communications, and James Ramsey, president of AFCEA's Tokyo Chapter.

During the business session, the annual election of officers took place, with Col. Walter E. Lotz, Jr., Signal Officer of the Eighth Army, chosen to head the chapter. Other officers elected were: first vice-president—William L. Wardell, Chief of Communications, Office of the Economic Coordinator, Republic of Korea; second vice-president—Col. C. W. Janes, Senior Signal Advisor, U. S. Army Advisory Group; third vice-president—Col. J. W. Grant, Signal Officer I Corps (Group); secretary-treasurer—Wendell B. Carman, Signal Corps contractor technician on duty with KMAG.

In introducing Minister Lee, Colonel Lotz announced that the Minister had become an associate member of AFCEA and officially welcomed him into the Association.

Prior to his discussion of communications problems in his country, Minister Lee expressed his gratitude for the opportunity of addressing so many communicators and his hope that through such an organization closer relationships between the people of the world would be established.

Among the ninety members and guests present were delegations from the Republic of Korea Ministry of Communications, the OEC, and the U. S. Armed Forces.

Chicago—Mr. W. C. Hasselhorn, president of Cook Electric Company, was host to the chapter's March meeting. Appearing with him are Arthur J. Schmitt, president of Amphenol Electronics Corp., at left, and Chapter President Raymond K. Fried.

UMI

Lexington

The work of the Nucleonics Laboratory at the Lexington Signal Depot was discussed at the March meeting of the chapter by Phillip G. Jackson, nucleonics scientist at the Lexington Signal Depot.

In his talk on "The Atom Comes to the Bluegrass" he discussed various aspects of the nucleonics operations at the Depot which is the only laboratory for the processing of film badges for the Army.

The laboratory at the Signal Installation tests all photo-film badges worn by all Department of Defense persons who work with radioactive materials. A photographic film badge records the amount of radiation the body of the wearer has absorbed. The badges are sent to the Lexington Laboratory each week from military installations in the United States and Overseas. Approximately 20,000 films are processed each month. Within two days after receipt of the film from the user, a report with recommendations, particularly if the radiation absorption rate is considered dangerous, is sent to the Installation where the badges were received for test.

Mr. Jackson also spoke on radiological defenses, radiological safety and the probable results of a hydrogen bomb attack in this area.

The program also included "Operations Ivy," a 28 minute movie depicting hydrogen bomb tests in the Pacific Testing Area, demonstrations of skills and techniques of photo-dosimetery detection and evaluation.

Fort Monmouth—Pre-dinner gathering at March meeting. Seated, left to right, William Christopher, first vice-president of the chapter; Dr. R. D. Shelton, Admiral Corporation, the guest speaker. Standing, left to right, Brig. Gen Stuart S. Hoff, commandant, The Signal School; Lt. Col. Mervin C. Bowers, chapter secretary; and Brig. Gen. Earle F. Cook, commander, Army Signal Engineering Laboratories.

London

Visits to plants of two foreign associate group members of the AFCEA featured the January and February activities of the chapter.

The Plessey Co., Ltd., was host at its main works at Ilford on January 16th. Messrs. W. W. Clark and John A. Clark, directors of Plessey, welcomed the chapter members and guests.

A tour of the works covered the following: C42 and vactric shop; components division M/c shop; equipment division M/c shop; tool room; radio and TV assembly shop; loudspeaker assembly shop; aircraft division M/c shop; electronics development laboratory; telephone assembly, and vibrator shop. A display of Plessey products was viewed at the conclusion of the tour.

Dinner speaker was Mr. M. W. Clark who discussed the origin and growth of The Plessey Company and outlined future developments.

Mullard, Ltd., was host to the chapter at Mullard House, its new headquarters at Torrington Place, London, on February 14th. Talks by Mr. S. S. Eriks, O.B.E., Mullard managing director and Mr. T. E. Goldup, C.B.E., director of Mullard and a vice president of the chapter, acquainted the AFCEA group with the background of the host company and its research and development program.

Demonstrations of various electronic techniques (including products not yet commercially available) were presented as follows: automatic broadband measurements at X-band; multi-cavity Klystron as a stable source at X-band; communications equipment; high-brightness cathode ray tube; transistorized AM and FM radio sets; power transistors driving a Ferrite Memory; transistor oscillator working at 100°C; avalanche transistor; transistor transmitter; transistor D.C. converter; transistor shift register; transistorized oscilloscope; precision pulse oscilloscope; precision pulse generator, and ultrasonic machining.

In addition, the group saw one of U.K.'s science films produced by countries of the Western European Union—"Mirror in the Sky."

The Hurlingham Club in London was the scene of the chapter's annual ladies' night on March 14th. Business was dispensed with and the evening was devoted to a social hour, dinner and dance. Major Russ C. Foss, chapter secretary, officiated as toastmaster.

Special guests were: Maj. Gen. and Mrs. G. H. H. Vulliamy, honorary life member of the AFCEA; Lord and Lady Glanusk, Mullard, Ltd.; and Cdr. and Mrs. C. G. Mayer, managing director, RCA Great Britain, Ltd., and a past

(*Continued on page* 120)

Korea—Col. Walter E. Lotz, Jr., chapter president, greets Mr. E. J. Lee, Minister of Communications of the Republic of Korea, who addressed the February meeting. Others pictured are, left to right: Col. O. G. Buser, Deputy Signal Officer, EASCOM; Col. S. K. Kim, Chief Signal Officer, Republic of Korea; Col. J. W. Grant, Signal Officer, First U. S. Corps; Col. C. W. James, U. S. Army Advisory Group; A. J. Allen, Communications Advisor, O.E.C.; H. H. Choi, Vice Minister of Communications, Republic of Korea; W. L. Wardell, Chief Communications, O.E.C.

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Farnsworth Electronics Company is the IT&T system's second largest research and development unit in the U.S.... with advanced facilities for the fabrication, production, assembly and test of electronic equipment and systems for the armed forces.

Farnsworth activities in this area currently include: missile guidance, countermeasures, infrared systems, fire control radar, circuit research, closed circuit TV, special purpose tubes, solid state and applied physics . . . plus many other projects.

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Other distinguished developments by resources of IT&T companies include: VOR, DME, Navascreen, Navarho, VHF Airport Radio Direction Finder, automatic weather "typewriters" for transatlantic planes (serving the new weather reporting

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Kuthe Laboratories, Inc., is the world's largest manufacturer of hydrogen thyratrons . . . meeting the requirements of the armed forces for aircraft, missiles and other heavy-duty applications.

Kuthe hydrogen thyratrons are vital components of aircraft fire control radar, ground fire control radar, air and surface search radar, ground control approach radar and aircraft weather radar. Other major uses of hydrogen thyratrons include: missile guidance systems and counter-countermeasures.

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Newark, New Jersey

FEC — AN ASSOCIATE OF IT&T

Federal Electric Corporation is the principal installation, maintenance and training organization for the IT&T system's laboratories and plants.

FEC was selected for two of the most important communications projects in national defense plans—the recruiting and training of technical manpower to operate and maintain the DEW (distant early warning) Line and White Alice (Integrated Communications Alaska).

FEC is prepared to provide skilled technicians for posts throughout the world.

FEDERAL ELECTRIC CORPORATION
Lodi, New Jersey

system called Narcast) . . . and now more recently, Tacan (Tactical Air Navigation) installed in U. S. military planes and scheduled for integration in the nation's common civil air navigation system known as Vortac . . . as well as Over-the-Horizon microwave links and Tacan Data Link, an important tool for speeding the flow of air traffic; guidance systems and electronic countermeasures.

These are but a few of the outstanding contributions of IT&T research, development and manufacturing facilities in the United States. Many more will come as IT&T scientists and engineers continue their task of unlocking the secrets of this atomic, electronic and supersonic age . . . bringing new strength to our country as a mighty and growing force for international peace.

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president of the chapter.

Louisiana

A color television broadcast of Kraft Theatre at the Walther Bros. Auditorium featured the chapter's March 27th meeting.

Mr. C. C. Walther, past president of the chapter, was host to the AFCEA group. A cocktail hour and buffet supper preceded the evening's program.

New York

"White Alice," the communications project that when completed will connect thirty-three Air Force sites throughout Alaska, was the subject of the March 27th dinner-meeting at the Belmont Plaza Hotel. The program was presented by Lt. Col. John D. Crisp, Chief of the White Alice Project.

Colonel Crisp described the system, which employs microwave radio relay and tropospheric scatter, and stated that eventually it will cover 3300 route miles and 170,000 telephone circuit miles.

He reported that the third link of the White Alice Alaskan communications system was officially opened on March 30th and that the completed segment of White Alice now covers a distance of 368 route miles, making use of two tropospheric scatter stations and seven microwave relay stations. The entire cost of the project is expected to be in excess of $130 million. Installation and cost of electronic equipment at each of the 33 sites is approximately $2 million.

In describing some of the equipment, Colonel Crisp stated that extreme ice and snow conditions necessitate the use of three oil furnaces in each parabolic tropospheric antenna, with each furnace capable of 500,000 BTU's to melt ice formations.

When completed, White Alice will be a vital part of the continent's air defense enabling combat centers of the Alaskan Air Command to receive reports of aircraft detected by the DEW Line, north of the Arctic Circle. Because of its ability to carry many messages and conversations at the same time, the new communications network will also serve Army and Navy installations, the CAA and the people of the Territory.

London—Mullard Ltd. (AFCEA group member) was host to the chapter for its February meeting. Left to right are: Capt. E. F. Metzger, USN, chapter president; Mr. S. S. Eriks, managing director, Mullard Ltd., and Mr. T. E. Goldup, Director, Mullard Ltd., both of whom addressed the meeting.

Northwest Florida

Col. R. B. H. Rockwell, Director of Communications – Electronics, Air Proving Ground Command, was elected president during the chapter's recent annual elections. Formal installation of the new officers took place at a meeting on March 21st.

The other new officers are: vice-president—Lt. Col. Blair Baylor, USAF (Ret.); treasurer—Maj. William F. Brown, APGC; and secretary—Capt. Edmund G. Forkner, APGC.

Paris

The chapter held a dinner-meeting at the Cercle Militaire on March 22nd. The acting president, Arian H. deGeode welcomed several distinguished visitors including Rear Admiral Joseph N. Wenger, USN, Director of Communications and Electronics, The Joint

(*Continued on page* 122)

Lexington—The Nuleonics Laboratory of the Lexington Signal Depot presented the program of the March meeting. Pictured around a film densitometer, which was part of a display of nuclear detection equipment, are, left to right: Phillip Jackson, nucleonics scientist, who was the principal speaker; Maj. K. J. Holmes, chapter president; William C. Jordan; Michael Keller, chapter secretary; John W. Davis; John Roche; and Raymond Soard, chapter vice president.

UMI

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The new Northern Radio Regenerative Repeater is designed for use in telecommunication circuits to re-shape and re-time distorted signals for local use or retransmission. Special provision has also been made for use of this unit on half duplex circuits — where it will not only regenerate the ordinary teleprinter signals but also faithfully reproduce such special signals as "break" signals and "mark restoration" information.

Further provision has been made for use of this Regenerator with synchronous binary signals on either single channel circuits or multi-channel time division multiplex systems. Provision is made to synchronize this unit from an external source.

- **Maximum Acceptable Signal Distortion:** new circuitry accepts up to 47% mark or space distortion.
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- **Completely Self-contained:** includes power supply and line battery.
- **OTHER OUTSTANDING FEATURES:**
  - — faithfully reproduces "break" signals
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Frequency Stability of Time Base Generator:	Less than 1 point range loss for ± 10% line voltage variation or ± 20° C ambient change from 25° C
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Chiefs of Staff, and former vice-president of the chapter.

Annual elections were held and placed into the presidency, Brig. Gen. Frank W. Moorman, U.S. Army Attaché, France, with other new officers as follows:

Vice-Presidents—Maj. Gen. E. Blair Garland, Chief Signal Officer, SHAPE; Rear Admiral Frank Virden, Director, Communications—Electronics, USEUCOM; Mr. Alexander deBondini, Vice-President, International Automatic Electric Company. Honorary Vice-Presidents—Dr. E. M. Deloraine, Technical Director, International Telephone and Telegraph Company; Mr. G. Rabuteau, Managing Director, Le Materiel Telephonique Company; Mr. Maurice Jean, Director, Group Electronic Company Francaise Thomson-Houston; General de Division Charles Bobet, Chief Signal Officer, Allied Forces Central Europe.

Directors—Col. Charles M. Baer, Chairman, European Military Communications Coordination Committee; Col. Arian H. deGeode, Manager of International General Electric Company; Col. William E. Heltzel, Chief Signal Officer, Allied Land Forces Central Europe; Col. Ross T. Sampson, Allied Air Forces Central Europe; Lt. Col. Estell S. Thurston, Headquarters, Signal Officer, SHAPE; Mr. Joseph R. Pernice, European Manager, Collins Radio Corporation.

Secretary-Treasurer—Lt. Col. Charles E. Harrison, Assistant Military Attaché, Paris, France.

Following the business session, Mr. Pierre Chouipe of the Services d'Expansion Technique of Kodak-Pathe Company presented a lecture on "Color Photography." This included information on types of film, lighting, portrait posing, filters and other technical aspects of color photography. Mr. Chouipe's talk was supplemented with color slides and a live model for demonstrating various techniques. Members were invited to bring their cameras and receive expert technical advice on any of their photographic problems.

London—Chapter members were guests of The Plessey Co., Ltd., (AFCEA group member) at its main works at Ilford in January. Shown above, left to right, are: Capt. F. C. B. Jordan, USN, chapter vice president; Mr. M. W. Clark, director, Plessey Co., Ltd., guest speaker; Chapter president E. F. Metzger and Mr. John Clark, director, Plessey Co., Ltd.

Philadelphia

On February 20th, the chapter met jointly with the professional group chapters of the Institute of Radio Engineers and the Franklin Institute. The subject, "The SAGE System and its Implementation," was presented by Brig. Gen. Stanley T. Wray, USAF, Chief of Electronics Defense Systems Division in New York, and Robert Bright, Jr., Superintendent, Systems Engineering, ADES, Western Electric Company, Inc., New York.

The speakers described the development of the system, explained its functioning and outlined how the Air Force, the Western Electric Company and many other manufacturers have teamed up to implement the system as rapidly as possible. Slides were used to illustrate the talk.

The meeting was held at the Franklin Institute following a reception and dinner. Toastmaster for the evening was Brig. Gen. J. Harry LaBrum, national director of the AFCEA.

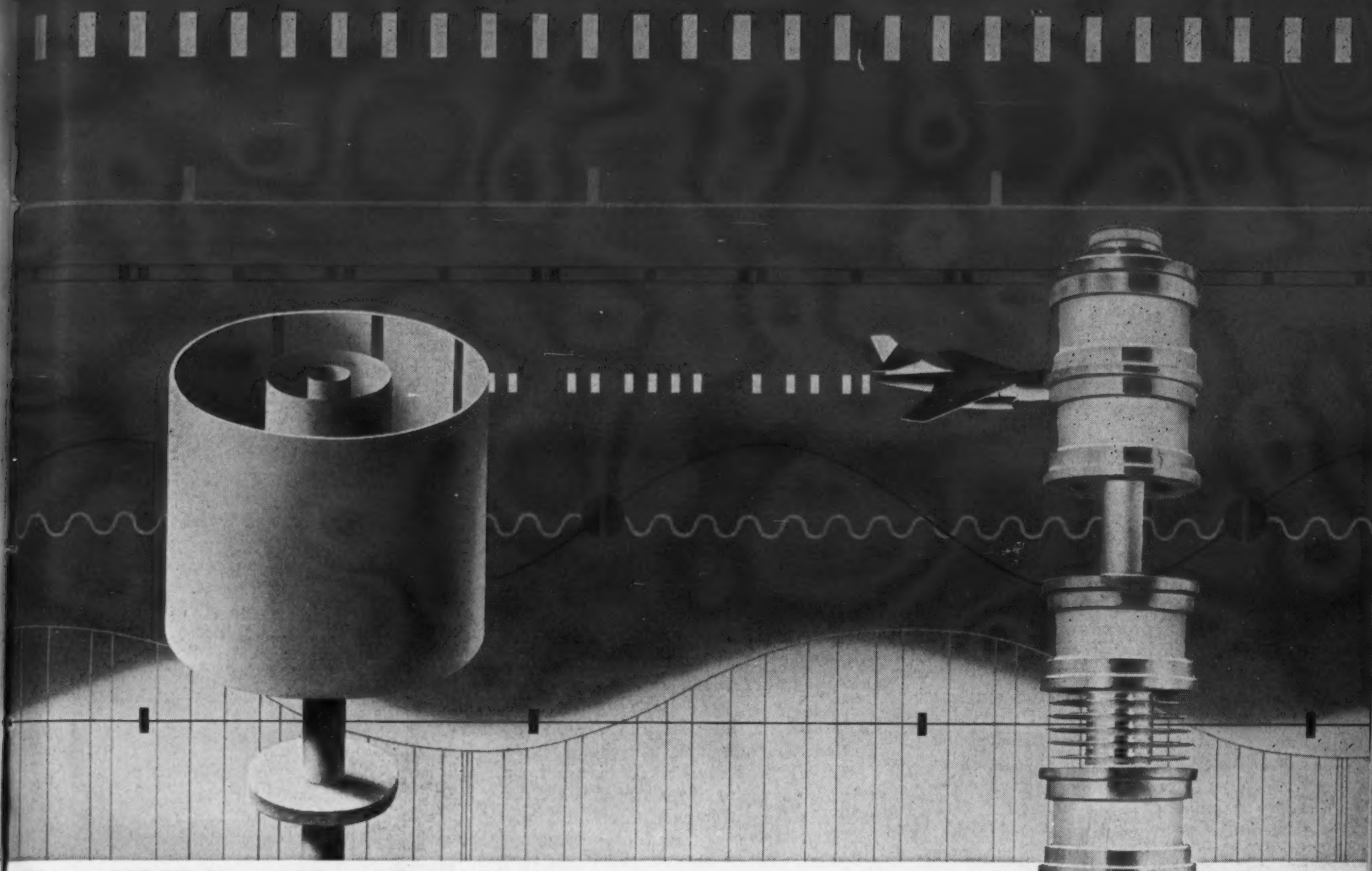
Pittsburgh

The Pittsburgh Chapter also held a joint meeting on the subject of "SAGE." Co-sponsors were the American Institute of Electrical Engineers and the Institute of Radio Engineers, with the meeting held at the Mellon Institute on February 18th.

Featured speakers were Brig. Gen. Stanley T. Wray, USAF, Chief of Electronics Defense Systems Division in New York, and Ernest W. Baker, Assistant Project Manager, Engineering, ADES, Defense Projects Division, Western Electric Company. Their combined presentation, illustrated with slides, gave a comprehensive account of the civilian and military aspects of the development and operation of the SAGE System.

(*Continued on page* 124)

Paris—Guests and newly elected officers pictured at a meeting at the Cercle Militaire in March. Left to right: M. Pierre Chouipe, Paris office of Kodak-Pathe, guest speaker; Lt. Col. Estell Thurston, Hqs. Signal Officer, SHAPE; Lt. Col. Charles Harrison, Asst. Military Attache, Paris, secretary-treasurer; Rear Adm. Frank Virden, Director of Communications-Electronics, EUCOM, 2nd vice president; Mr. Arian de Geode, manager of International General Electric, director; Brig. Gen. Frank Moorman, U. S. Military Attache, Paris, president; Rear Adm. Joseph N. Wenger, Director, Communications-Electronics, The Joint Chiefs of Staff, a former vice president of the chapter; Col. Charles Baer, Chairman, EMCCC, director; Dr. E. M. Deloraine, Technical Director of IT&T, honorary vice-president; and Col. William Heltzel, Chief Signal Officer, LANDCENT, director.



Eimac X676 Modulating Anode Klystron

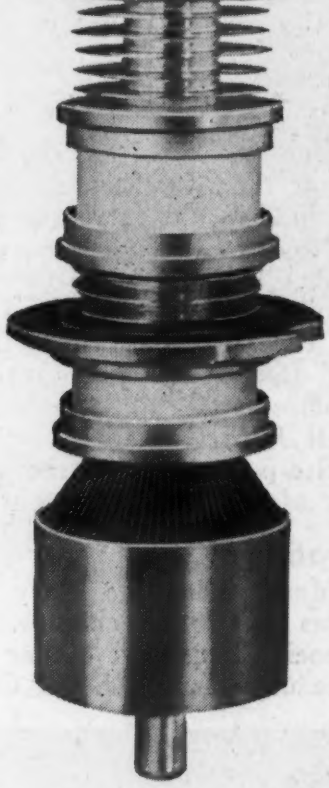
Shaped RF Pulse, 30 KW Peak Power Output for 955-1220 mc Air Navigation Systems

Designed for air navigation systems, the Eimac X676 three cavity, air cooled klystron will deliver 30 KW peak power output in the 955 to 1220 mc range. With a power gain of 35 db, this tube has an efficiency of 40 per cent.

A typical air navigation systems requirement is a shaped RF pulse output to eliminate spectrum interference in adjacent channels. The Eimac X676 conservatively meets the 60db requirement of the CAA's air navigational system without using critically tuned, expensive filters in the RF output transmission line. The modulating anode permits pulsing the beam current while keeping the accelerating voltage constant. Also, the modulator circuit for this application is quite simple.

The RF cavities are external to the vacuum system and detachable from the klystron. The user may purchase spare tubes without buying additional tuning and focusing assemblies.

For the design engineer, the features of the X676 simplify circuitry — for the equipment operators the X676 provides reliable, long-lived performance at moderate cost.



For further information about the Eimac X676 Modulating Anode Klystron, consult our Application Engineering Department. Also available are two highly informative booklets; "The Care and Feeding of Klystrons" and "Klystron Facts . . . Case Four".

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Eimac First in high power amplifier klystrons

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Typical Pulse Operation X676

DC Beam Voltage	24 KV	Power Output	32 KW	Power Gain	35 db
DC Beam Current	3.3 Amps	Driving Power	10 watts	Average Power	1 KW
Power Input	80 KW	Efficiency	40%		

CHAPTER NEWS

On March 29th, Copperweld Steel Company's Wire and Cable Division at Glassport played host to approximately 140 chapter members and guests. The group was welcomed by Mr. F. E. Leib, Manager of Sales of Copperweld Steel.

Rocky Mountain

A chapter meeting was held on February 21st at the famous Antlers Hotel in Colorado Springs. Attendance at the combined banquet and meeting totaled 109 members and guests.

Mr. P. B. Reed, Vice President-in-charge of Government Service Department of RCA Service Company of Camden, New Jersey, was the main speaker of the evening and presented a program on the missile tracking facilities at Patrick Air Force Base, Florida. The program included color slides, a color film on all phases of missile testing procedures and actual films of the firing of many types of Air Force and Army missiles.

Distinguished guests at the meeting included Lieutenant General and Mrs. Atkinson, Commander of Air Defense Command; Major General and Mrs. R. H. Lynn, Vice Commander, Air Defense Command, and Brigadier General and Mrs. Haskell E. Neal, Deputy for Communications and Electronics, Headquarters CONAD and first president of the Rocky Mountain Chapter.

Sacramento

Captain Les Williams of the California Highway Patrol was the featured speaker at the March meeting of the chapter, held in the Sacramento Signal Depot Officers' Club.

Captain Williams spoke on "The Communication System of the Highway Patrol," explaining how an "All Points Bulletin" from headquarters reaches the patrol officers.

Darrell J. McConnell of United Air Lines, also participated in the program, showing a short color film on Hawaii.

San Francisco

On March 28th the Navy Department was host to the chapter. Following a social hour and dinner held at the Treasure Island Officers' Club, 150 members and guests boarded the Navy Picket Ship, the USS "Scanner" (YAGR-5). Her Captain, Lt. Cmdr. H. H. Pruett, welcomed the group at the ship's social hall and gave a comprehensive talk on the role played by the Picket Ships in the USAF reconnaissance operations.

San Francisco—Capt. E. B. Patterson, USN, Director of Communications, Western Sea Frontier and a chapter director, speaking before the March meeting which was sponsored by the Navy.

The tour through the ship included inspection of the CIC and radio communications quarters. Here officers on Cmdr. Pruett's staff gave detailed explanations of the operation of the radar and radio equipment, and told how reconnaissance information is processed and relayed to shore stations.

A visit to the ship's brigade and living quarters was also made part of the tour.

Scott-St. Louis

Major General Edward H. Underhill, Vice Commander, Headquarters Air Training Command, addressed the March 1st dinner-meeting held at Augustine's Restaurant in Belleville.

General Underhill discussed his experiences and observations as a member of the Military Armistice Commission in Korea, which met with the Communists to settle details of the armistice at the end of the conflict. He elaborated upon the differences in background and thinking which must be understood before they can be effectively counteracted.

One hundred and ten members and guests were in attendance.

South Texas—Featured speaker at the March meeting was Col. J. Francis Taylor, Jr., Commander, 1800th AACS Wing, Tinker AFB. Shown with Colonel Taylor (center) are Stephen H. Simpson, Jr., chapter director and past president, at left, and Col. Albert H. Snider, USAF, chapter president, at right.

South Texas

The chapter's March 21st meeting at Randolph Field Officers' Club was addressed by Colonel J. Francis Taylor, Jr., Commander of the 1800th AACS Wing at Tinker Air Force Base, who presented an authoritative talk on the problems encountered in the use of radio navigational aids by aircraft flying at very high altitudes.

Not only does a jet pilot at high altitudes run into interference problems from signals located several hundreds of miles apart, Colonel Taylor said, but the characteristics of signals from radio beacons and beams change at high altitudes. As he went on to explain, when a jet aircraft at high altitudes flies through the leg of a radio range, it tends to push that leg ahead, so that instead of being over a known location on the ground, the aircraft is actually several miles farther along on its course. This has caused considerable confusion and is a problem to the air traffic controller

Scott-St. Louis—Maj. Gen. Edward H. Underhill, Vice Commander, Headquarters, Air Training Command, Scott Air Force Base, addresses the March meeting. Also shown is Elmer J. Weber, Southwestern Bell Telephone Co., chapter vice president.

when he attempts to plot the course of an aircraft making position reports to him while flying at high altitudes.

The speaker also pointed out the problem of flight checking navigational aids at high altitudes. Flight checks on radio facilities are normally performed in good weather with the pilot being able to determine his position over a known location on the course by visual means. Flight checking at 40,000 feet is considerably more difficult because of the more limited time when the weather is clear from the ground to 40,000 feet, and because it is much more difficult to locate the exact position of an object at extremely high altitudes.

Colonel Taylor's presentation, accompanied by slides, pictorially showed tests that had been run on high altitude flight checks, and indicated that considerable study and research is still necessary on this problem of using navigational aids by jet aircraft.

(Continued on page 126)

THE FLIGHT HEARD 'ROUND THE WORLD

Recently three B-52 bombers flew around the world in 45 hours and 19 minutes. They were only specks in the vastness of the sky, yet they were in voice-contact every mile of the way—with SAC headquarters in Omaha, with each other, with bases along the route and with the KC-97 tankers that refueled them in the air.

Their speed-of-light contact was the AN/ARC-21 liaison communications set in each of the ships. This is a long-range, pressurized, high-altitude airborne system, capable of world-wide communications. It may be operated by the pilot, so no radio operator is needed. It is characterized by minimum training requirements, simplified maintenance, high reliability, positive channel selection —with a choice of any 20 of 44,000 frequencies.

In this as in other ways, RCA serves our Nation's armed forces. RCA scientists and engineers are constantly creating, designing and producing new and better electronic systems and equipment.

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DEFENSE ELECTRONIC PRODUCTS *CAMDEN, N. J.*

Tinker-Oklahoma City—Guest speakers at the chapter's annual research symposium are shown above. Left to right: Mr. Paul Davis, Texas Instruments, Inc., representing industry; Chapter President Loyd Dorsett; Col. Edward A. Friedlander, Air Research and Development Command; and Dr. Homer Hicks, Magnolia Petroleum Company, representing education.

Southern Connecticut

Mr. Walter Wainwright, Head of the Special Devices Branch of UDT (Underwater Demolition Teams) and Amphibious Section, U. S. Navy Underwater Sound Laboratory, New London, was the featured speaker at the March 28th dinner-meeting held at the Wonder Bar Restaurant in Bridgeport.

With "Underwater Communications" as his subject, Mr. Wainwright discussed and displayed equipment used by demolition crews to communicate with other crews, boats, and submarines, both on and below the surface of the water. He also showed a sound movie on underwater creatures and the sounds they make.

Tinker-Oklahoma

The chapter's annual research symposium was held at the Student Union Building, University of Oklahoma, on March 22nd. The program was presented by three speakers representing military, education and industry. Chapter President Loyd Dorsett acted as moderator.

The first speaker, Colonel Edward A. Friedlander, Air Force Research Liaison Officer, Air Research and Development Command in Baltimore, Md., spoke on "The Challenge of Research in Defense."

Dr. Homer Hicks, Director of Field Development, Magnolia Petroleum Company, Dallas, Texas, representing education, discussed his experiences in promoting science and engineering in the Southwest.

Representing industry, Mr. Paul Davis, Director of Semiconductor Development, Texas Instruments, Incorporated, Dallas, Texas, spoke on "The Role of Industry in Military Electronic Research" and related some of the experiences of industrial laboratories in the growing field of communications and electronics.

Guests included representatives from the University of Oklahoma; the Naval Air Technical Training Center at Norman; Army, Navy and Air Force ROTC and reservist personnel, the Oklahoma Development Council, Frontiers of Science and the State Legislature.

Washington

Major General A. L. Pachynski, Director of Communications-Electronics, USAF, was guest speaker at the March 7th luncheon meeting held at the Willard Hotel.

General Pachynski's address appears on page 59 of this issue.

Other guests at the head table were: Mr. Richard H. Aue, Director of Communications Division, B.D.S.A.; Maj. Gen. C. J. Bondley, Jr., USAF, Director of Supply and Services, DCS/Materiel; Maj. Gen. D. F. Callahan, USAF, Assistant for Programming, DCS/Operations; Mr. Russell Hughes, Director of Production, Communications and Mobilization Planning, OASD S&L; Maj. Gen. T. P. Gerrity, USAF, Assistant for Production Planning, DCS/Materiel; Brig. Gen. D. C. Doubleday, USAF, Airways and Air Communication Service, HQ, Andrews Air Force Base; Mr. Paul Goldsborough, Staff Director of Communications, OASD S&L; Brig. Gen. Albert T. Wilson, Jr., USAF, Deputy Chief of Staff, Operations, Military Air Transport Service, Andrews Air Force Base; Brig. Gen. M. A. Preston, USAF, Deputy Director of Operations, DCS/Operations; Col. B. M. Wootton, USAF, Deputy Director, Communications-Electronics, DCS/Operations.

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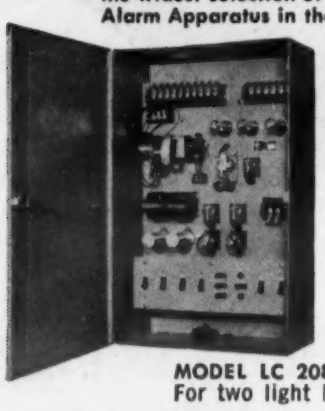

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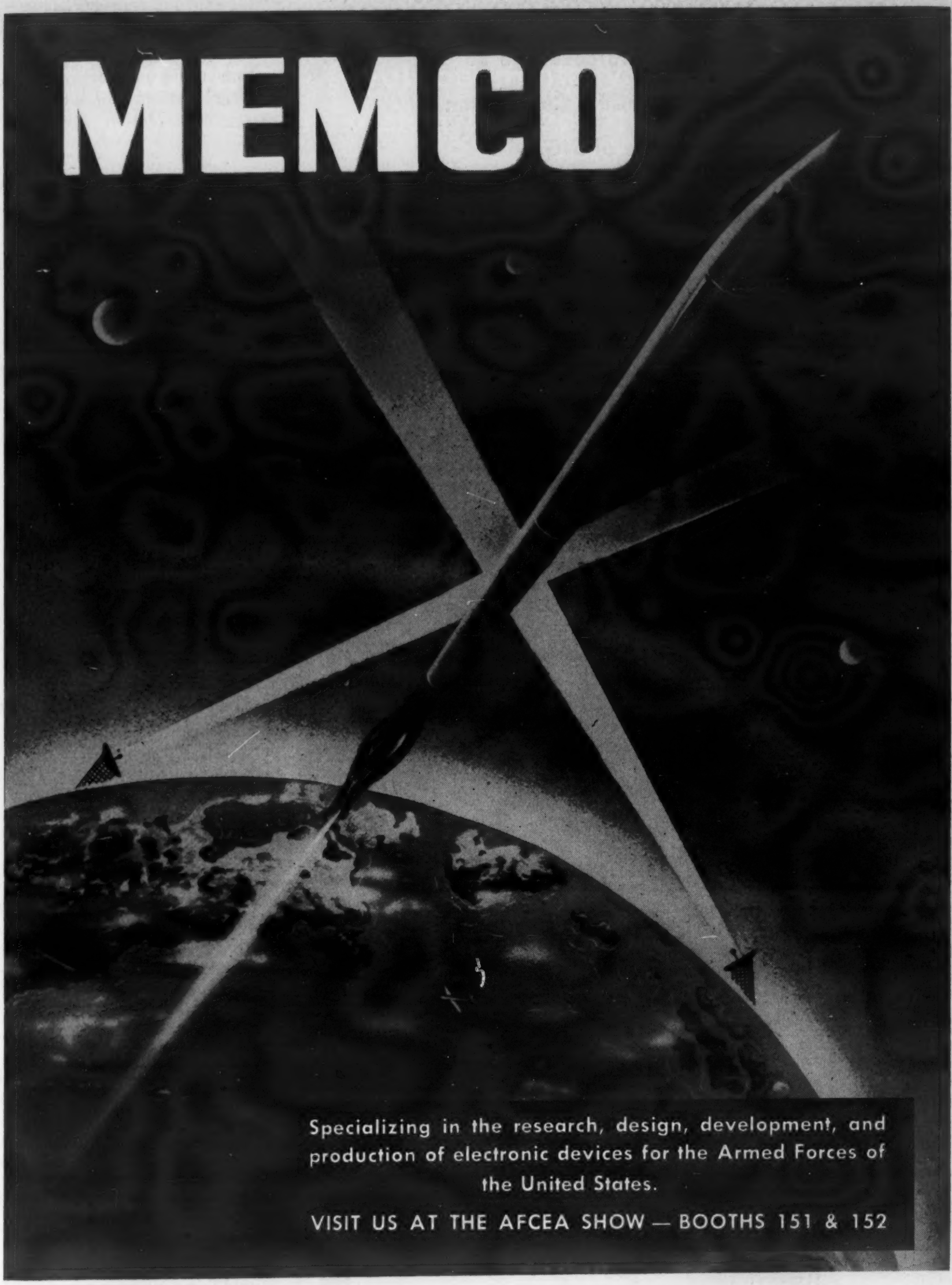
Northeastern University—Newly elected officers of the Northeastern University Chapter's Division A are congratulated by Col. Murray D. Harris, SigC, PMST for Northeastern, and vice president of AFCEA's Boston Chapter. Left to right are: Maj. Fred J. Frank, chapter advisor; Cadet 1st Lt. Wilfred J. Picard, president; Cadet 2d Lt. Edward O'Keefe, treasurer; and Cadet 2d Lt. Thomas King, secretary.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the 11th Annual AFCEA Convention
in the July issue of *SIGNAL*

This report will include . . .

Speeches • Technical Papers • Panel Discussions

Guided missiles of the future are *on our scopes today*—thanks to the agile brain of an amazing new ECM Simulator developed for the Air Force by Hallicrafters RDA.*

Designed for advanced study of jamming, deception and countermeasures techniques, the device furnishes to the PPI scope exact simulations of moving targets, and jamming, *in infinite variation*.

Programming may be generated according to predetermined plan, or targets may be controlled manually. *Speeds as fantastic as 270,000 m.p.h.*, as well as radical directional changes, now can be simulated for planning tomorrow's countermeasures.

ECM Simulator is another example of electronic design leadership that has made Hallicrafters a prime mover of key military projects for over 22 years.

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*Rapid Development Assistance

Air Traffic Control

(Continued from page 67)

The successful evolution of a modern air traffic control system is dependent, among other things, upon a successful evolution of appropriate instrumentation for both ground and air. While much of the technology now exists in one form or another, there is a requirement for the adaptation of this technology and development of procedures for its use. This includes data handling and display, radar improvements, mechanized communication techniques, position determination, area marking, and many others. These should be among the tasks assigned to an integrated research and development facility.

It is essential that the National Aviation Facilities System, which is required to provide the smooth and healthy growth of aviation, has a continuing program of modernization that will encompass all the functions, including such diverse items as runway and taxiway layout, dispatch procedures, terminal area control, enroute separations, path stretching techniques, and landing.

What I have said here, of course, represents only an outline of our recommended approach to provide an adequate system of facilities. Many more specific details are being developed. It is obvious, however, that a job of this magnitude can only be accomplished by operational and engineering people working together in Government and industry, using the best modern scientific methods of operations research and experimentation. Much of the required engineering talent and many of the facilities must be furnished by industrial organizations competent in various aspects of the field. If industry is to supply top flight talent, they have the right to expect from Government that an authoritative agency is available to decide on programs to be developed and to supply adequate direction to the work. Without this decisive direction from Government, much time, money, and manpower will inevitably be wasted on efforts which do not directly contribute to the final goal.

Whatever system and development program is decided upon, it is certain that electronics in all its phases will play an important and essential part. The members of your organization, therefore, have a special interest in continuing your activities in a field where you have already contributed so much.

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Admiral® develops military **TV CAMERA** with mid-day vision in deep twilight

...on land

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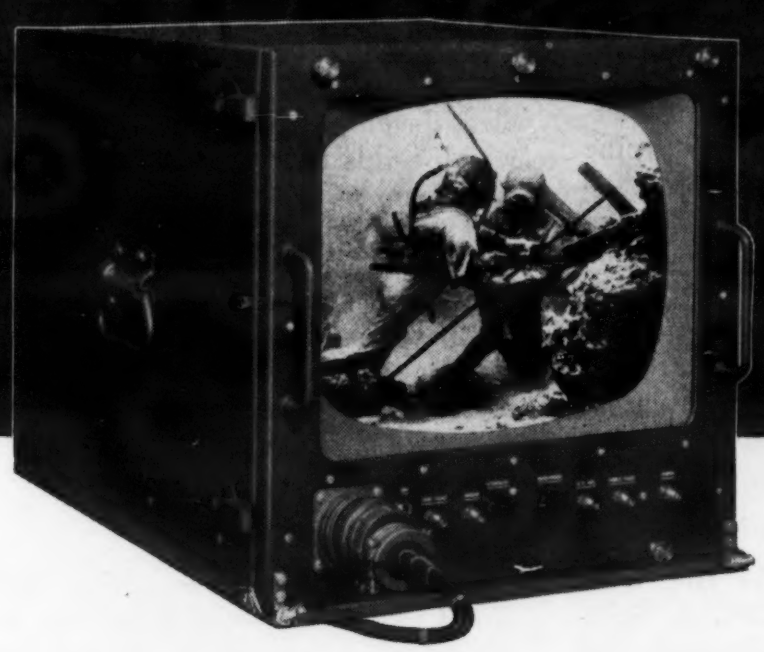

The image orthicon may not be pictured for reasons of security. However, the monitor on which the picture is displayed is commercially available. Designed for the Armed Forces, it is a unit of unsurpassed quality offering superb resolution, extremely good linearity and such unusual features as control of size independent of linearity and the ability to reverse the phase of the signal. Write for detailed description and price.

The human eye is a remarkably sensitive instrument. But it is no match for the image orthicon TV camera developed by Admiral for the Armed Forces. Light from an ordinary match reveals as much to this TV camera as a man with 20/20 vision sees in the light of a 150 watt bulb. Obviously, the armed services will find countless ways to use this sharp-eyed observer for reconnaissance under adverse conditions.

Admiral developed the special circuitry that gives the image orthicon its amazingly keen "eye-sight." For all its extreme sensitivity, there is no penalty in excess bulk or weight.

Admiral has also "packaged" the unit to permit its use not only for land-based and airborne reconnaissance, but *even under water*. Development of the image orthicon again demonstrates Admiral's engineering capabilities in the field of military electronics. Inquiries are invited.

LOOK TO *Admiral* FOR RESEARCH • DEVELOPMENT • PRODUCTION IN THE FIELDS OF: MILITARY TELEVISION COMMUNICATIONS UHF AND VHF • RADAR RADAR BEACONS AND IFF • RADIAC TELEMETERING • DISTANCE MEASURING MISSILE GUIDANCE • CODERS AND DECODERS CONSTANT DELAY LINES • TEST EQUIPMENT ELECTRONIC COUNTER MEASURES

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ITEMS OF INTEREST

From Government, Industry and the Services

Pictured above are some of the visitors at the recent Nuclear Congress who were afforded their first opportunity to sit at the controls of an operating nuclear reactor.

Nuclear Reactor Exhibited

The world's first mass produced nuclear reactor, the AGN 201, developed by Aerojet-General Nucleonics of San Ramon, California, was, for the first time, exhibited for the public at the Nuclear Congress in Philadelphia.

Over twelve thousand people were afforded an opportunity to see this nuclear reactor in operation. Among the viewers were 200 scientists and engineers from "Atoms for Peace" countries, who were able to sit at the control console of a reactor and have complete and safe direction over a nuclear chain reaction of fissioning and splitting uranium atoms.

The story of AGN's production, which involves 21 reactors in the construction stage, was recorded by the "Voice of America" for broadcasting throughout the world.

Human Engineering Institute

Dunlap and Associates, Inc., will present its 5th Annual Human Engineering Institute at Stamford, Conn., during the week of June 17, 1957.

Giving special emphasis to advanced as well as basic concepts, the Institute will deal with design of equipment and systems to meet human requirements. Senior members of the Institute's professional group will present a planned sequence of lectures and participate in small group discussions aimed at acquainting design and development people from industry and military organizations with the newest data and techniques of Human Engineering.

Enrollment will be limited to permit appropriate attention to specific needs and interests. The fee is $290.00.

A Squeeze of the Hand Demonstrates Digital Converter

A novel spectator-participation display, which utilized a hand "squeeze" device, was exhibited by the Industrial Products Division of Federal Telephone and Radio Co., Clifton, N.J., at the 1957 IRE Convention in New York City. A lightweight, compact analog-to-digital converter, called the Andicon, was the model demonstrated.

The Andicon permits the user to take information, usually presented in the form of a wave or graph on a chart or oscilloscope, and instantly convert the data into easily readable numbers. A hand grip actuates a servo which drives the Andicon, whose coded output is fed into an automatic typewriter. The information then appears in digital form directly proportional to the strength of a hand grasp.

Designed for use in radar studies, navigation, aircraft instrumentation, telemetering, and wind tunnel aircraft engineering work, the analog-to-digital converter has application in many fields.

Navy Has New Five-Inch Rocket

ZUNI, a new five-inch high velocity aircraft rocket named for the Pueblo tribe of Indians, has been announced by the Navy.

Developed for the Navy's Bureau of Ordnance by the Naval Ordnance Test Station, China Lake, Calif., the ZUNI has been approved for operational use in the fleet. It has almost twice the velocity of the World War II model it replaces.

In tests it has proven ability to hit hard, rapidly and accurately. As an air-to-ground weapon, it will be highly effective against tanks, pillboxes, trains, motor convoys, fuel dumps, and small ships. As an air-to-air weapon, it will have a high kill potential against aircraft because of its high velocity and consequent short target time. One ZUNI is capable of bringing down a jet plane.

The Naval Ordnance Test Station also developed the ZUNI launcher, which holds four rockets and is used for transporting and storing the rocket as well as launching it. Thus, greater speed in re-arming planes as they return to their bases between combat strikes is achieved, and greater economy is provided by the elimination of conventional packing crates.

Army Units Visit IT&T Labs

Two Army Reserve units, sponsored by International Telephone and Telegraph Corporation, toured Federal Telecommunication Laboratories, IT&T's research division in Nutley, New Jersey, recently. They heard talks by the Labs' engineers who developed some of the Armed Forces' latest communication and navigation equipment.

The units were the Headquarters and Headquarters Detachment 352nd Signal Batallion (Support), composed mainly of IT&T employees, and the 311th Signal Company (Support), made up of personnel of American Cable & Radio Corporation,

(*Continued on page* 132)

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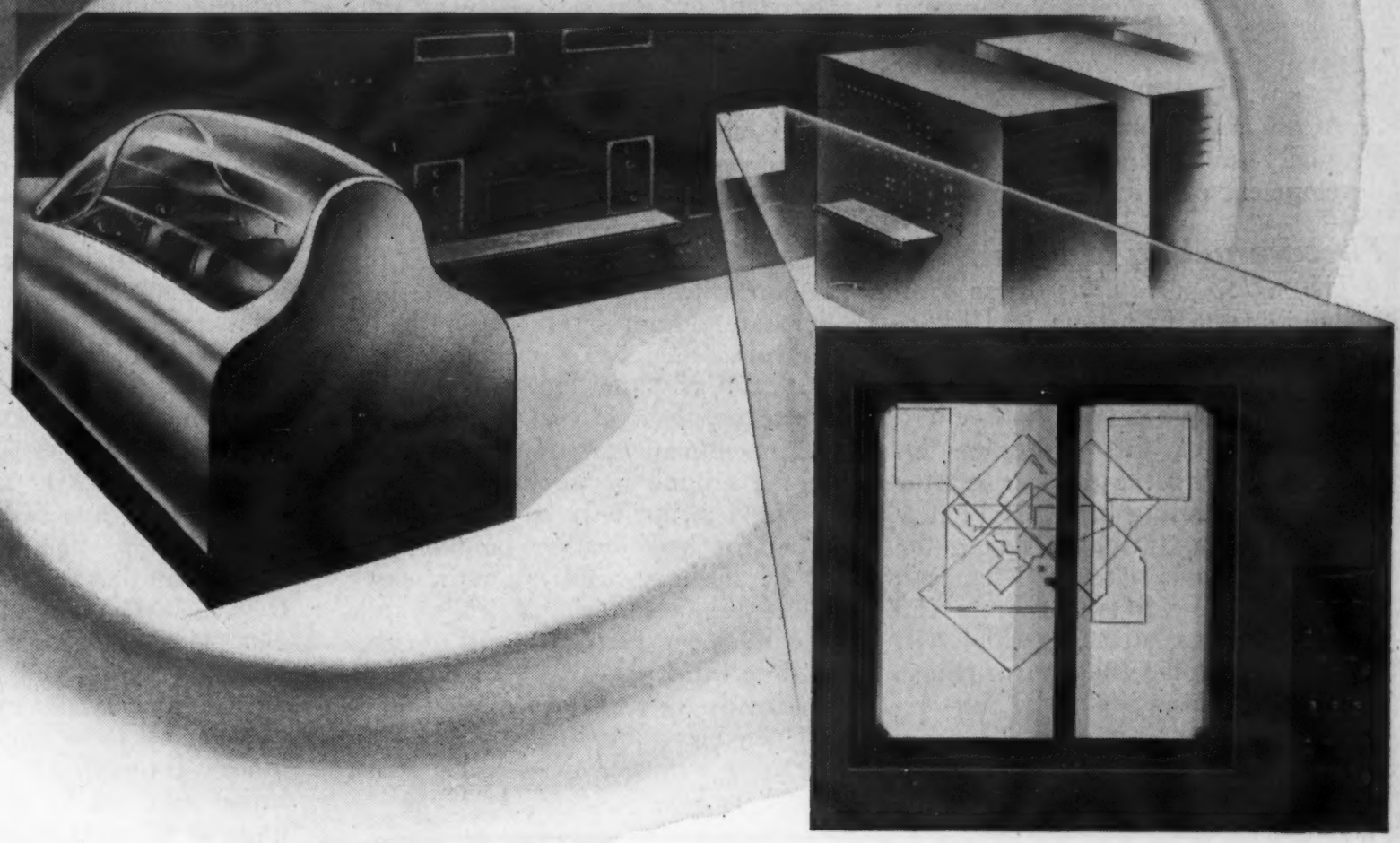
ATLAS BUILT PLOTTING BOARD



Scoreboard For Tomorrow's Pilots

THE plotting board designed by Melpar Inc.—scoreboard of the new U.S. Air Force supersonic simulator for F-100A planes—is another example of Atlas manufacturing ingenuity at work.

Atlas specializes in "precisioneering" electro-mechanical assemblies from the pilot stage to production efficiency. Furnishes the practical engineering step and the facilities between the idea and the production line.

Bring your electro-mechanical designs to us. Our design, production and methods engineers, tool makers and skilled mechanics are ready to work on your project on a job basis . . . as many men, machines and hours of work it requires and no more. Every modern tool and cost cutting technique is at your service to save you time and labor on a complete electro-mechanical assembly or a special part for electronic equipment. Write today for your copy of "Precisioneering Electro-Mechanical Equipment." ATLAS PRECISION PRODUCTS CO., Philadelphia 24, Pa. (Div. Prudential Industries).

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The reservists heard addresses by the engineers who developed TACAN, VORTAC, and over-the-horizon microwave systems. They toured FTL's famed 300-foot experimental microwave tower, and were guests of IT&T for luncheon in the Labs' Clubhouse.

The Batallion standard was displayed for the first time during an inspection by Rear Admiral Ellery W. Stone, USNR (ret.), President of AC&R, and Henri Busignies, FTL President and prime mover in the development of TACAN.

First Refueling of Nautilus

The *USS Nautilus* was refueled for the first time in Groton, Conn., after steaming over 20,000 leagues from power generated by her reactor.

Refueling of the submarine involves replacing the nuclear reactor core and installing an entirely new heat generating machine inside the empty steel container which remains. The new core will incorporate important technical advances which will greatly extend the fuel performance, as well as making it simpler, less expensive and more reliable.

The atomic submarine *Seawolf*, which is bigger and faster than the *Nautilus* and uses liquid sodium as a reactor coolant instead of pressurized water, has already begun her sea trials in the Atlantic.

Breaking the Weather Barrier

The concept of breaking the zero-zero weather barrier for safe aircraft operation appears more optimistic as a result of tests on an electronic "brain" developed by Bell Aircraft Corporation.

Principal parts of the new device are an electronic computer and a radar unit which may be installed either on landing strips or carrier decks. A plane flying in zero visibility and zero ceiling atmosphere, brought within a "radar gate" as far as four miles away from the runway, can safely land by fully automatic controls.

It differs from present remote-control systems in that no visibility and no human operator is necessary on the ground or in the plane. The new system not only has commercial value for bad weather landing, but useful military application in cases where pilots suffering from wounds or fatigue can land by means of automatic control.

Already tested extensively on land, the new electronic device is now undergoing comprehensive testing at sea by the Navy.

World's Largest Electronic Brain

The world's largest electronic "brain," built by the Radio Corporation of America, has been installed at the Army Ordnance Tank-Automotive Command Headquarters in Detroit.

Known as Bizmac, the $4.1 million electronic data processing system has reduced months of paper work to minutes of push-button operation. It keeps track of more than 100,000,000 facts about the Army's vast inventory of tank and automotive spare parts throughout the world—everything from nuts and bolts to entire engines. At electronic speed, Bizmac can take inventory, catalog spare parts, prepare manuscripts for catalogs, forecast supply requirements and produce budget summaries.

The Bizmac system includes four basic units: Input Devices for preparing and feeding information and instructions into the system; Storage Devices for filing information within the system so that it is readily accessible on demand; Data Processing Devices for sorting and computing as dictated by instructions; and Output Devices for providing finished copies of the information required. Since Bizmac operates on the "building block" principle, a business organization can use as many or as few units as it needs to do its job.

War Missile Becomes Weather Observer

A supersonic antiaircraft missile built by the Army is being converted into a peaceful weather observer by scientists at the Naval Ordnance Laboratory, White Oak, Md. Originally known as the Loki rocket, the new weather observer has been renamed the Hasp-high-altitude sounding projectile.

As a single-stage solid-propellant rocket which can be fired from 5-inch naval guns, the Hasp will enable ships at sea to make regular meteorological observations to altitudes over 100,000 feet. A timing device in the dart's nose splits open the casing at the summit of its flight and ejects instruments to detect temperature and humidity in the ionosphere.

The weather instruments are lowered back to earth by a balloon which is inflated when the dart's casing splits. The telemetering equipment in the balloon sends back temperatures and humidity in the layers of air through which it passes. An included tracking system enables the balloon to supply data about wind

(*Continued on page* 134)

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YOU WILL work out ways of using high-speed computers to solve complex real-time problems. This involves a comprehensive analysis of the problem, formulation of the logic to be used in the solution, coding it into the computer's language and checking the completed program.

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(An independent non-profit research organization — long-range scientific advisors to the Air Force.)

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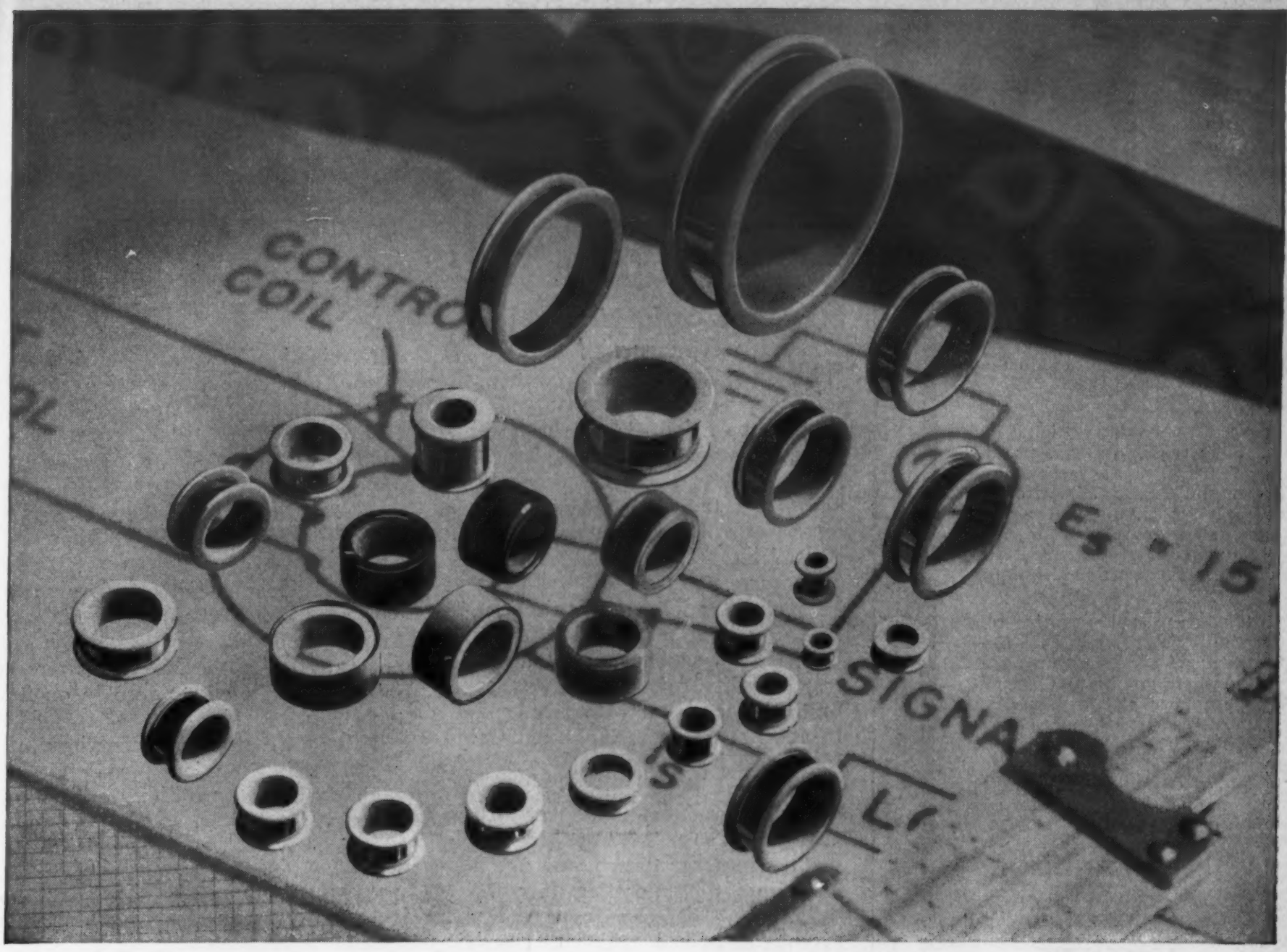

In BOBBIN CORES, you need PRECISION

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Ultra-thin tape for bobbin cores is rolled to high precision standards for thickness and finish on our own 20-high Sendzimir cold reducing mill, beta-ray controlled.

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"TAPE-WOUND BOBBIN CORES FOR COMPUTER APPLICATIONS"

Includes essential data on applications and properties, fabrication and testing of Arnold Bobbin Cores; lists standard sizes, etc.

ADDRESS DEPT. S-75

For use in shift registers, coincident current matrix systems, pulse transformers, static magnetic memory elements, harmonic generators and similar equipment, Arnold Bobbin Cores meet the most exacting requirements.

Quality and uniformity? *You'll find them no problem*—because, as a fully integrated producer with highly modern facilities, we're able to maintain close control over every step.

Arnold Bobbin Cores are available in a wide range of sizes, tape thicknesses, widths and number of wraps depending on the ultimate use of the core. Magnetic materials usually employed are Deltamax, Permalloy and Supermalloy, in standard thicknesses of .001″, .0005″, and .00025″. Core properties include quite rectangular hysteresis loops, relatively low coercive values and high saturation densities, plus the ability to shift in a few microseconds from negative remanence to positive saturation, and vice versa, under conditions of pulse excitation. • Let Arnold supply your requirements for Bobbin Cores—or other tape-wound cores, powder cores, permanent magnets, etc.—from the most complete line of magnetic materials in the industry. WSW 6399

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We are looking for engineers to help us maintain our lead in the electronics industry and to continue our rapid growth. Positions are available in all phases of engineering: development, design, and production.

Our present activities include transistor circuitry, digital and analog computer systems and circuitry, VHF receivers and transmitters, video circuitry, magnetic circuit and component design, design of novel r-f circuitry, instrumentation and communication techniques.

If you can make creative contributions to any of these fields, we can offer you an atmosphere of mutual respect, the opportunity to work in almost every field of modern electronics, the guidance of outstanding senior engineers, and a chance to grow professionally as fast as your performance permits.

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ITEMS OF INTEREST

direction and velocity at succeeding levels of descent.

For the first time, in January, 3 Hasp darts were launched from a Navy rifled gun for rapid air measurements. The engineers at Ordnance Laboratory believe that a fully-instrumented Hasp can be test launched within a year.

New Anti-Submarine Defense Command

Reorganization of the fleet anti-submarine warfare forces was announced by Admiral Jerauld Wright, USN, Commander-in-Chief, U.S. Atlantic Fleet. The new command, known as the Anti-Submarine Defense Force, U.S. Atlantic Fleet, will expand the responsibilities and tasks of the present force.

Heading the new organization is Vice Admiral Frank T. Watkins, USN, who has been reassigned the responsibility for planning war-type protection and control of shipping. In addition to operational and training tasks, he spearheads the activities of the U.S. Atlantic Fleet in the anti-submarine field, and has extensive cognizance of ASW research matters in order to program new devices into the operating forces.

The new defense force will be given centralized authority for all anti-submarine efforts of the fleet with certain other responsibilities in connection with the Atlantic Fleet's mission of defending the U.S. from attack through the Atlantic. This includes dual-purpose seaward extension of the radar early warning line that stretches across the top of the continent, in which special electronically equipped ships and aircraft are engaged constantly. The fleet units are on the alert to detect both submarines and aircraft which may be enroute to the U.S. coastal areas.

In the field of training, the new organization operates on a wider scale than the older force since it supervises the coordinated inter-type training of the several fleet forces—air, surface, and submarine—with anti-submarine capabilities.

Electrical Engineer Award

Eta Kappa Nu Association, national electrical engineering honor society, announced the openings of nominations for the 1956 Outstanding Young Electrical Engineer.

Awards are made on the basis of social and civic accomplishments as well as technical achievements. Nominations are solicited from all accredited colleges, American Institute of Electrical Engineers, Institute of Radio Engineers and employers of electrical engineers.

Candidates do not have to be members of Eta Kappa Nu, but must be less than 35 years of age and have baccalaureate degrees in electrical engineering from colleges in the U.S. and Canada within ten years prior to May 1, 1957. Selections are made by a Jury of Award appointed from leaders in industry and education by the National President of Eta Kappa Nu.

Nomination forms may be obtained from A. B. Zerby, Executive Secretary, Eta Kappa Nu Association, P.O. Drawer 447, Dillsburg, Pa., and should be returned no later than May 31.

Phone Dialing Applied to Nike

Bell Telephone Co. has developed new electronic techniques in dialing long distance phone calls which have been applied to the Nike antiaircraft missile, enabling it to zero in on its target.

Albert S. Barnes, supervisor of customer information for Bell, explained that the problems and solutions were similar. He pointed out that in the U.S. and Canada there were 60 million telephones, with 1,800 billion different calls possible.

"With the firm's new system of customer dialing by long distance through a numbering plan system, the two countries are divided into 100 different geographical areas. All you need to do is dial the first three digits of the area involved, then the last four numbers direct," he said.

The Nike, using the identical system, automatically chooses the appropriate air patch in which the enemy bomber is flying. This is related to a sky chart in which the sky is broken down into grid patterns.

World's First Tropospheric Scatter System

The Federal Telecommunication Laboratories, Nutley, N.J., have built and designed the world's first tropospheric scatter system with a band sufficiently broad to carry a television signal and up to 120 telephone channels.

It will be placed in operation between Florida and Cuba by late summer. The northern terminal, at Key Largo, will be operated by the Long Lines Department of the American Telephone & Telegraph Co., as part of the Bell System, while the southern terminal at Guanabo, near Havana, will be run by the Radio Corp. of Cuba, an affiliate of the Interna-

(*Continued on page* 136)

Systems engineering—38th parallel style

Here's the challenge we received from the Korean Civil Assistance Command and the U. S. Army Signal Corps:

Build a telephone communications system to their specifications that will function over mountainous terrain. Cost to be within reasonable limits . . . upkeep minimum . . . equipments compatible with the experience and background of the population.

The answer is the system now being installed in South Korea.

Manually operated telephones, central offices and PBX switchboards, suited to a civilian population unfamiliar with dial methods.

Wire lines for basic country-wide linkage, augmented with many channels of *Carrier,* wherever estimated traffic warrants it.

And—delivery on schedule.

S-C STROMBERG-CARLSON COMPANY

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General Offices and Factories at Rochester, N. Y.—West Coast plants at San Diego and Los Angeles, Calif.

GD GENERAL DYNAMICS

tional Telephone & Telegraph Co. The most spectacular aspect of each terminal will be two wave reflectors, each 60 feet high and wide, to be installed 200 feet apart.

Possessing a 70 mc. transmitter, receiver and driver-amplifier, the tropo system is said to have a maximum effective range up to 185 miles. Line-of-sight wideband radio systems will link each power-amplifier-reflector unit with telephone or TV circuits in Havana and Miami.

Quadruple-diversity wave transmission and reception is provided for the best possible results, regardless of prevailing radio transmission conditions. This diversity also provides a complete standby channel, in case of failure of some component. With all transmitters, receivers, and reflectors operating, the system can carry two complete television programs simultaneously.

Cost of the scatter equipment, without antennas and installation, is said to be about $1 million, while upkeep is expected to be around $140,000 a year. Similar links are in various stages of development in Europe and the Western Hemisphere.

Saving Spectrum Space

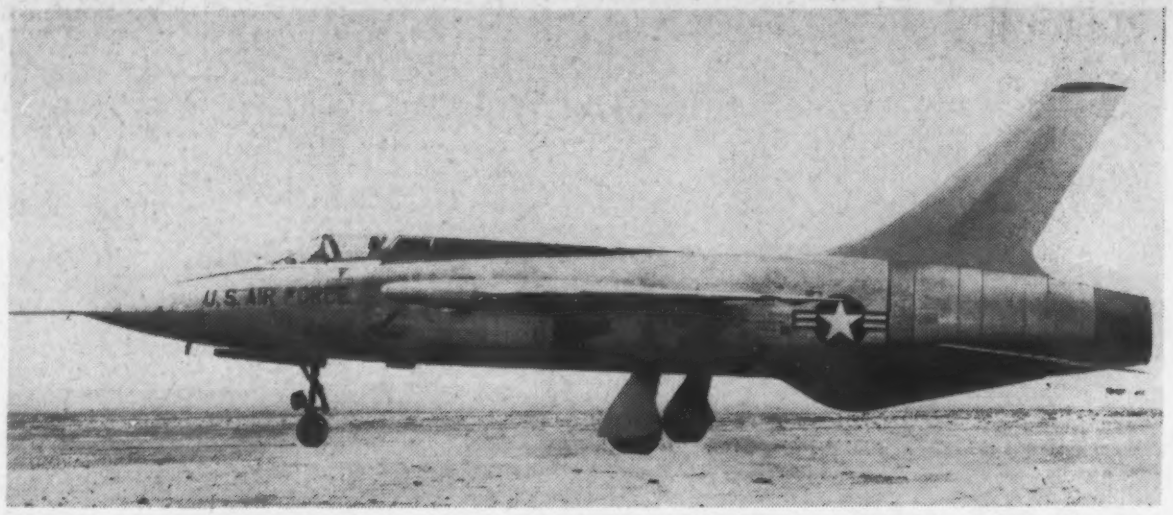
Due to the increasing scarcity of frequencies in the radio spectrum, means of saving spectrum space are receiving cooperative attention from industry and the Federal Communications Commission.

In order to find room for new users, help to reduce interference, and obtain more efficient use of the radio spectrum, three conservation techniques have been offered to relieve heavily congested frequency bands. They are known respectively as "offset carrier," "single sideband" and "split channel" operation.

In the first, a station may be required to operate with its carrier frequency "offset" 10 kilocycles above or below the normal carrier frequency. A channel assigned to such a station is designated "plus" or "minus" accordingly. This results in less mutual interference and makes more assignments possible.

The "single sideband" eliminates the two-sideband transmission which utilizes more frequency space than is actually required. By eliminating one sideband, a narrower channel may be used, assignments can be made closer together, and room is made for added stations. A further improvement is in making use of what is called "suppressed carrier." The power of a station is concentrated in whichever sideband is being used and shuts down automatically, "between words," when power is not needed.

Through a combination of technical improvements in equipment, manufacturers have been able to produce equipment which can operate in channels half as wide as the previous designs. Thus, more assignments can be crowded into a particular band of frequencies by making use of "split channels," as more stations occupy a smaller amount of space.



Pictured above is the Air Force's new, supersonic fighter-bomber, Republic F-105 Thunderchief, which has been selected for volume production. Flying faster than sound on its very first flight, the Thunderchief has already proved itself in more than 250 test flights. It has been designed under the Weapons System Concept as a nuclear-bomb-carrying fighter and is powered by the Pratt and Whitney J-75 engine. Outstanding design features are the long, cylindrical fuselage, the short, very thin swept-back wings, the needle nose and the ventral fin on the bottom of the aft fuselage near the tail. Scheduled to reach a production peak late in 1958, the F-105 assembly line is already in operation.

The methods mentioned are not the only means of saving spectrum space. Government and industry are continually working closely together to develop new techniques in this vital area.

Army and Industry Strengthen Ties

A major step forward in strengthening the ties between the Army and industry was made with the activation of the new U.S. Army Reserve unit, the 262nd Signal Company, last month.

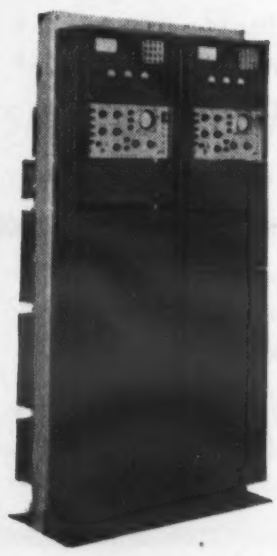
The new unit, sponsored by the American Cable and Radio System in Washington, D.C., exemplifies the strong relationship between industry and the Army Signal Corps. Such an affiliation will serve to strengthen our national defense now and in the future.

According to Brigadier General Kenneth F. Zitzman, Chief, Personnel and Training Division, Office of the Chief Signal Officer, the concept of affiliation goes back to the Civil War when commercial telegraph furnished much of the Army's required communications. He said, however, that "the present offers a new kind of challenge to the time-tested relationship between the Communications-Electronics industry and the Army Signal Corps—for the first time in history we have a requirement for a large and truly ready reserve force."

The activation ceremony was held in the office of Major General J. D. O'Connell, Chief Signal Officer in the Pentagon. The new unit is commanded by Captain Joseph J. Cancie, Assistant Superintendent of American Cable and Radio.

Among those attending the ceremony were Major General P. D.

(*Continued on page* 138)



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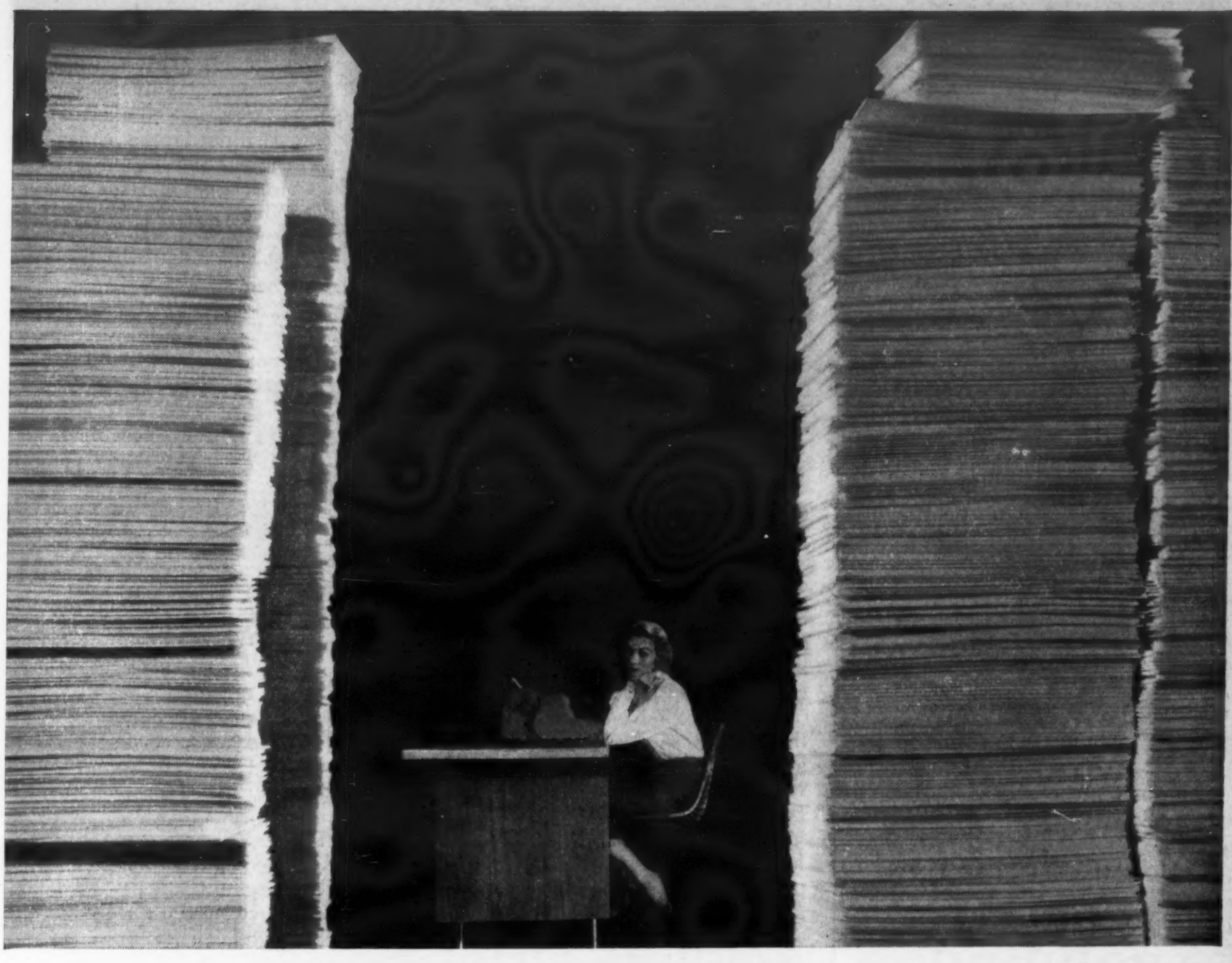

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RCA BIZMAC reduces weeks of paper work to seconds—cuts costs by millions!

In almost the twinkling of an eye, electronics handles calculations that would take any person days of work.

The newest – and largest – electronic "brain" (more accurately, electronic data processing system) is Bizmac, developed by RCA.

Bizmac is quickly becoming one of the most powerful allies of business and industry. It "reads," sorts, catalogs, analyzes, calculates, forecasts—reduces months of paper work to seconds—cuts costs by millions!

For insurance companies, Bizmac can digest mountains of statistics daily and put its finger on any one of millions of facts with push-button speed.

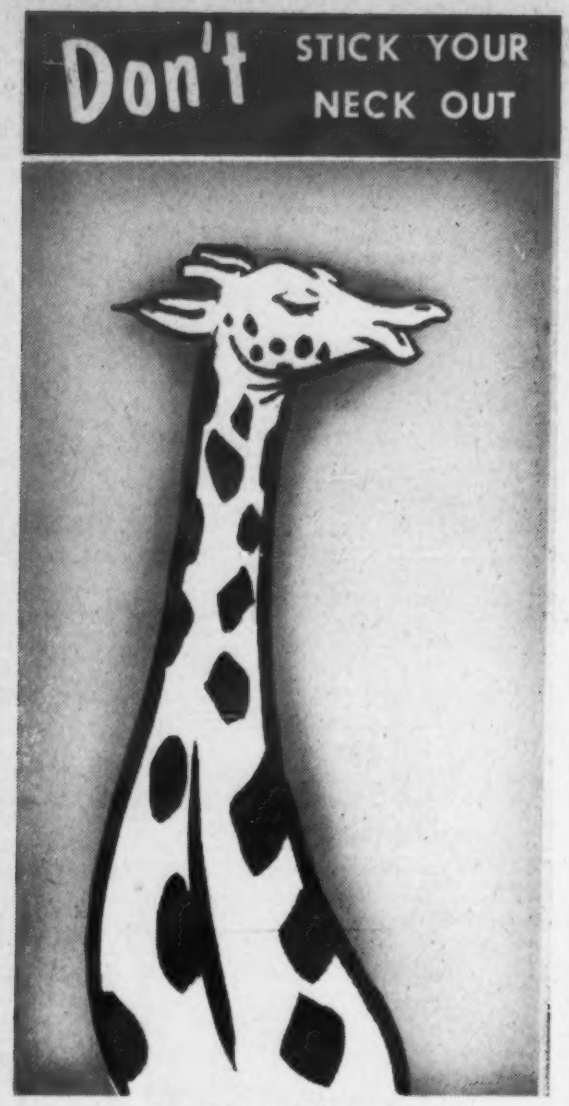
It can help department stores keep split-second inventory control, can greatly simplify warehousing, storage and product-supply problems for big chain-store operations.

And for the U. S. Army, it keeps track of literally *billions* of ordnance parts all over the world.

The leadership in electronic research that made Bizmac possible is inherent in all RCA products and services—to help make life fuller, easier, safer through "Electronics for Living." TMK(s)

RADIO CORPORATION OF AMERICA

ELECTRONICS FOR LIVING



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PROBLEMS

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If your equipment needs a case, it will pay you to learn more about Skydyne's exclusive service, and how it can help you. Write to Skydyne, Inc., River Road, Port Jervis, New York.

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ITEMS OF INTEREST

Ginder, Assistant Chief of Staff for Reserve Components; Major General Phillip E. Lindeman, Chief, Army Reserve and ROTC Affairs; Rear Admiral Ellery W. Stone (ret.), President, American Cable and Radio Corporation, New York; Major General W. Preston Corderman, Deputy Chief Signal Officer; Mr. Edward J. Girard, Assistant Vice President, Federal Telephone and Radio Co., and Assistant Vice President, Federal Communication Laboratories; Major General James R. Pierce, 2nd Army, Ft. Meade; Brigadier General Kenneth Zitzman; Col. Arthur Symonds, Assistant Publisher, ARMY; Col. W. J. Baird (ret.), Editor, SIGNAL .

Enlisted Personnel Benefit Association

A non-profit association open to "regular" enlisted personnel has just been organized, which makes available to the "enlisted man" certain benefits formerly enjoyed only by commissioned and warrant officers.

Created to advance and safeguard the economic interests of service men and women stationed throughout the world, The Armed Forces Enlisted Personnel Benefit Association will initially offer its members emergency loan privileges, scholarship grants to deserving children of members, and low-cost group life insurance. Additional benefits will be considered as membership increases.

Regulars of all grades (male or female) from all branches of the service are now eligible for membership. A board of directors, composed of enlisted personnel, will be elected annually by the members; however, officers, directors, and advisors will serve without compensation.

Information and applications may be obtained by writing The Armed Forces Enlisted Personnel Benefit Association, 422 Washington Building, Washington 5, D.C.

Engineering Show at Coliseum

Twenty thousand engineers in industry, who design consumer products and the machines which turn them out, are expected to attend the second Design Engineering Show at the New York Coliseum, May 20-23.

The show, which has grown in one year to a size which places it among the five largest annual industrial expositions, will bring to New York engineers from all parts of the U.S. and Canada, plus visitors from 15 other nations. Three hundred and seventy-five companies will exhibit component parts, materials, fasteners, finishes and coatings, shapes and forms, and accessories to product development. Representatives of the exhibiting companies will be present to answer the engineers' questions.

The exposition is the showplace for the original equipment market. Products which go into the making of end products are demonstrated.

Concurrently with the show, the machine design division of the American Society of Mechanical Engineers will sponsor a three-day conference on design engineering problems. The conference will open with a panel discussion of "Procedures in Developing New Designs" and will have sessions on the mechanical, materials, and electrical aspects of design engineering.

New Division at C.E.I.R.

The Council for Economic Industry Research recently held a demonstration at their headquarters, 1200 Jefferson Davis Highway, Arlington, Va., of an IBM giant electronic computer 704. The demonstration was given to announce the opening of the Council's new Computer Services Division. This division, in the words of Dr. Herbert W. Robinson, Council President, "will make available to the trained, imaginative minds of C.E.I.R.'s engineers, economists, scientists and mathematicians an extremely powerful tool which will gear up the effectiveness of these people in tackling difficult problems for our business, government and financial clients."

Examples of the types of problems which will be handled with the aid of the computer by C.E.I.R.'s staff are: economic development programs, market projections, production scheduling and operations research generally.

Rear Admiral, Nuclear Propulsion

The Royal Navy of Great Britain has announced the creation of a new post, that of Rear Admiral, Nuclear Propulsion.

The announcement of the position said that the Rear Admiral Nuclear Propulsion "will act as the focus within the Admiralty of the operational and material aspects of nuclear propulsion." It will keep in touch with developments made by the Atomic Energy Authority and by industry in the application of nuclear propulsion to ships. The new position is to be the link in such specified matters between the Admiralty and other Government Departments, Ministries and Services as well as commonwealth foreign Navies when appropriate. *(Continued on page 142)*

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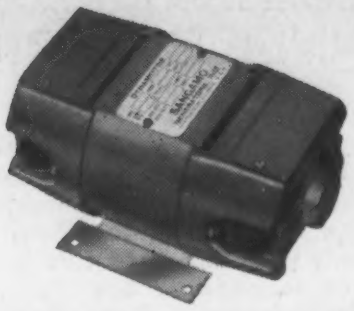

Photo at right shows operators inserting secondary coils and connecting leads to commutators for units like the compact Sangamo "GY" Flatpak—a rugged, small size dynamotor for mobile radio use.

Final assembly operation. Push line type of operations contribute substantially to overall efficiency and accelerated production . . . aids in fulfilling all delivery schedules, even for units like the Type SF below, which are built to the most exacting specifications.

Now...dependable power supply units on dependable delivery schedules

Sangamo expands facilities to meet growing demand!

Sangamo power supply units for the military and commercial fields—Dynamotors, Rotary Converters, Generators, Special DC Motors—are built to meet your most exacting specifications for quality and performance.

And . . . Sangamo has the facilities to insure prompt, efficient, volume delivery to meet *your* production schedules.

A new 200,000 square foot "controlled conditions" plant, in Pickens, South Carolina is equipped with the newest, most modern equipment to utilize the latest production techniques in the manufacture of these power supply units. This plant is geared for full-capacity production for units and components for mobile communication equipment. Look to Sangamo for your requirements.

SG57-1

SANGAMO
Electric Company
Electronic Components Division
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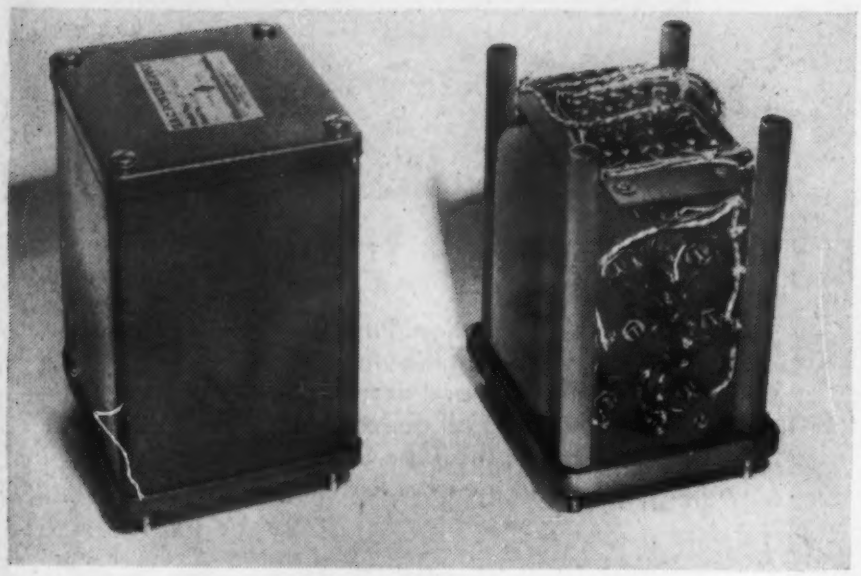
UAC tubeless DC to AC Converters

replace bulky dynamotors and inefficient vibrator power supplies



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- **COMPACT**—as little as ⅔ cu. in. per VA.
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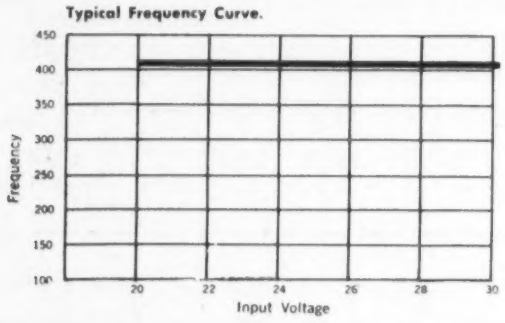
UAC high efficiency power supplies solve size, weight, vibration and shock problems in hundreds of mobile and aircraft applications. Efficiency over 90%; temperature stability from —55°C to 100°C can be achieved. 400 cps. and 1000 cps. both available.
Standard DC to AC units to 250 VA; custom units to 2 KVA.
DC to DC and AC to DC units also available, including unusual input-output combinations such as 28 VDC input, 115 VAC output; 115 VAC, 400 cps, 3 phase input; 250 VDC regulated output.

TYPICAL STANDARDS From 24 to 28 VDC Input

Model No.	Power	Output Voltage	Current Amps.	Case Size (inches)	Weight	List Price
10VA/50-400	10VA	50-400 CPS	.2	3 1/32 x 2 19/32 x 4 7/32	2 lbs.	$200.00
10VA/115-400	10VA	115-400 CPS	.1	3 1/32 x 2 19/32 x 4 7/32	2 lbs.	200.00
100VA/50-1000	100VA	50-1000 CPS	2	3 29/32 x 3 11/32 x 5 7/32	3½ lbs.	300.00
100VA/115-1000	100VA	115-1000 CPS	1	3 29/32 x 3 11/32 x 5 7/32	3½ lbs.	300.00

Typical Frequency Curve.



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PERSONNEL CLEARING HOUSE

AFCEA Members Available to Industry

The pages of SIGNAL are open to active AFCEA members who are seeking positions in the communications, electronics and photographic industries. Any member is entitled to space free of charge in this column for three issues of the magazine. Please limit your notice to five lines. In replying, employers are asked to address: Box ....., SIGNAL, 1624 Eye Street, N. W., Washington 6, D. C. Letters will be forwarded to the AFCEA member.

COMMUNICATIONS SPECIALIST—COMMUNICATIONS SYSTEM MANAGER with leased long-line interphone experience plus 10 years military and civilian air traffic control. Broad background in electronics, air operations, and flight movement. AB and LLB degrees. Will consider any location. Box 122.

FIELD ENGINEER: ELECTRONIC, COMMUNICATION, MARINE EQUIP'T. Data processing and automation. DOD project coordination. Branch Management, sales promotion, customer relations. Surveys and reports, subcontract and material expediting, program planning, production control, priorities. Box 123.

REPRESENTATIVE, with all clients performing R & D or supply work for Wright Field and other agencies, needs more lines to develop with both military and commercial potential. Preferred are electronics or photographic equipments and ANP (have AEC Access) or packaging material. Box 124.

MANUFACTURERS REPRESENTATIVE, WASHINGTON, D. C. Long established and contacting all government procurement points in Washington, D. C., has opening for an additional account. Prefer a company manufacturing an end-use item and which is already doing some business with the military. Can also cover Philadelphia and Fort Monmouth. Replies confidential. Box 125.

MANUFACTURERS LIAISON REPRESENTATIVE. Retired Lt. Colonel, Communications-Electronics Officer with twenty-one years experience. Education: Electrical Engineering and Business Administration. Familiar with Operational Suitability Testing and R & D. Desires to represent manufacturers or act as liaison for companies conducting business with Eglin Air Force Base, Florida. Box 126.

Government and Military Positions Available

Government and military agencies are invited to use this column to announce available positions which may be of iterest to the readers of SIGNAL. Notices will be published three times if not cancelled before. Applicants apply as indicated in individual notices.

THE SPECIAL DEVICES CENTER, an activity of the Office of Naval Research, located at Sands Point, Port Washington, Long Island, has several vacancies for electronic engineers at $7,035 a year and for Engineering Draftsmen at $4,080 a year.
Inquiries should be directed to the Industrial Relations Officer. Telephones: Flushing 7-8300 and Port Washington 7-3800.

ORDNANCE ENGINEER ($7,000 a year). Assistant Inspector of Naval Material, Germantown, Pa., has opening in development and production of ordnance equipment. Requirements: Bachelor's degree in engineering (or four years' equivalent experience) and 2½ years' engineering experience, one in ordnance engineering. Master's degree can be substituted for one year's experience; Doctor's degree in ordnance engineering can be substituted for all experience. For further information, write: Supervising Inspector of Naval Material, 17 Brief Ave., Upper Darby, Penna.

ELECTRONIC ENGINEERS, ELECTRONIC SCIENTISTS, MECHANICAL ENGINEERS, starting salaries $5,335-$6,390. ENGINEERING DRAFTSMEN, $3,415-$4,080. Vacancies now exist at the U. S. Navy Electronics Laboratory, a major West Coast scientific organization engaged in research and development of electronic equipment and systems. For further information address: U. S. Navy Electronics Laboratory, Civilian Personnel Division, San Diego 52, California.

RADIO OPERATOR TECHNICIANS. Veterans $3,400-$4,200 to start. Overseas opportunities. Amateur or commercial licenses helpful. Full pay during advance training. Good advancement opportunities. Submit resume with name, age, address, phone number—if any, military experience, private training, work experience, FCC licenses—if any. Armed Forces Communications and Electronics Association will forward same immediately to employer who will acknowledge your application direct.

(*Continued on page* 142)

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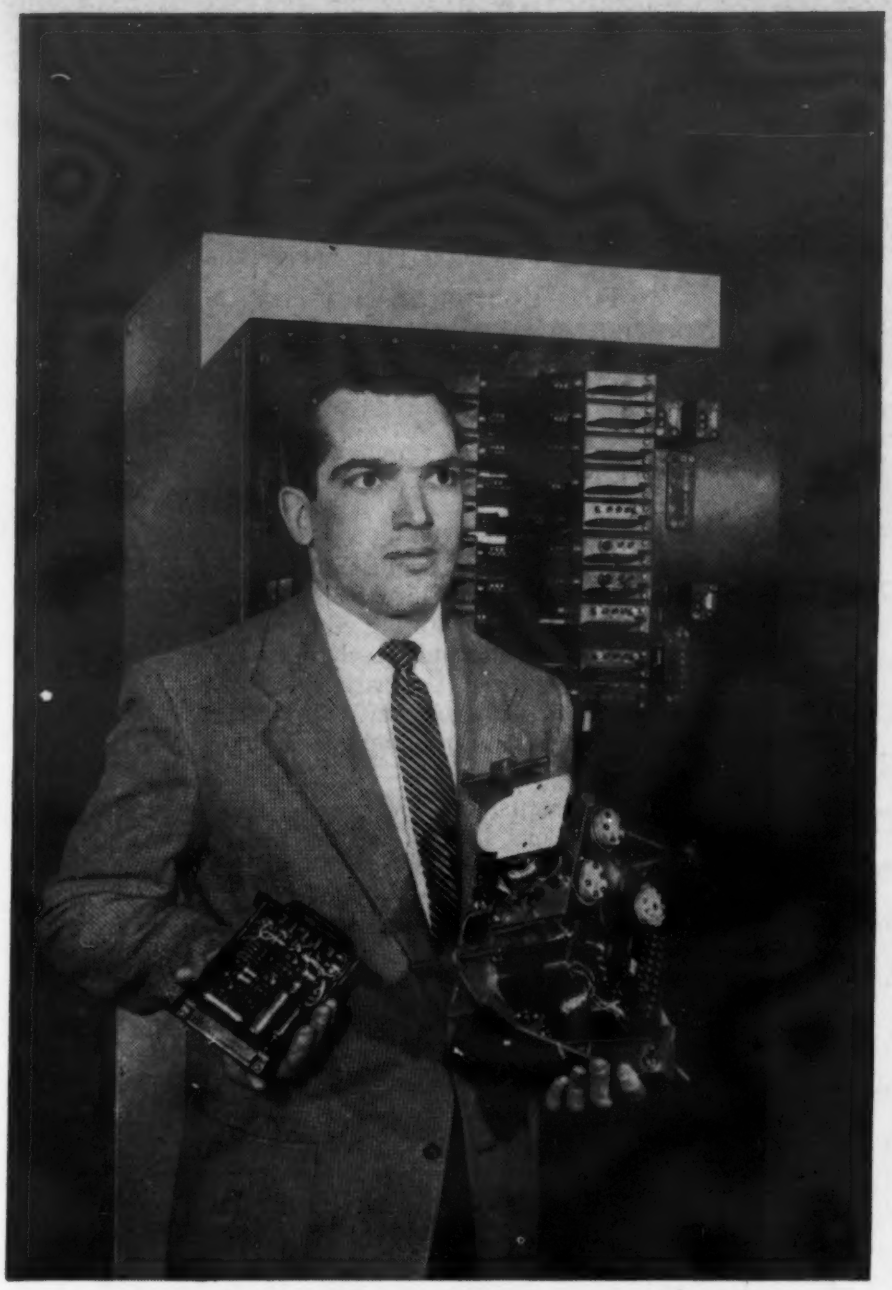


Robert Rossler, FICo engineer, holding plug-in analog modules — a transistorized amplifier unit and an electro-mechanical unit. Electronic panel of analog computer is in background.

FICo digital engineer Peter Carbone holding digital module, comprised of easily removable transistorized printed circuits. Rack-type digital computer is in background.

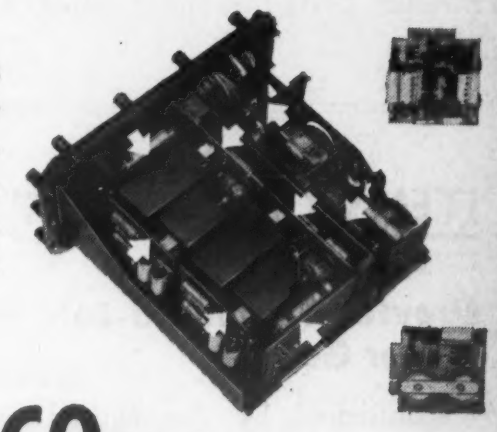
ANALOG or DIGITAL:

WHICH TYPE OF SPECIAL-PURPOSE COMPUTER IS BETTER?

THE ANSWER: ***It depends on the application.***

Ford Instrument develops and produces *both* types of computers — analog and digital — for an unlimited range of systems applications. FICo analyzes the problem and designs the computer best suited to the needs of the application, in terms of reliability, flexibility, economy, and size. For both types of special-purpose computers FICo employs modular techniques, simplifying the problems of design and manufacturing . . . and making servicing fast, simple, and economical.

FICo has developed and produced special-purpose computers to handle an extreme variety of problems — including missile and rocket launching, missile guidance, airborne and tank navigation, test and other data processing, degaussing, torpedo launching, gunfire control, and many others.



FICo modular techniques as applied to an amplifier for an airborne navigational system. Arrows point to printed circuit amplifiers. Two typical cards are shown at right.

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ENGINEERS of unusual abilities can find a future at **FORD INSTRUMENT CO.** Write for information.

TELETYPE OPERATORS AND CRYPTOGRAPHIC TECHNICIANS. Veterans $3,200-$3,700 to start. Overseas opportunities. Full pay during training period. Good advancement opportunities. Submit resume with name, age, address, phone number—if any, military experience, FCC licenses—if any. Armed Forces Communications and Electronics Association will forward same immediately to employer who will acknowledge your application direct.

ELECTRONIC TECHNICIAN ($7,570-$8,645 plus 25% (non-taxable) cost of living allowance). Major duties are to plan, direct and supervise the operation and maintenance of carrier, repeater, terminals, telegraph and associated equipment installed in the toll test rooms. Includes inspections of facilities to determine required training, the organizing of the training and when necessary the actual conducting of the training. Three years general experience required and three years specialized experience. Inquiries should be directed to Civilian Personnel Officer, Alaska Communication Systm, 550 Federal Office Building, Seattle 4, Wash.

ELECTRONIC ENGINEERS GS-5 through GS-12. These positions have a salary range of $4,480 through $8,645 per annum. Employees in these positions serve as advisors and consultants to Signal Corps Contracting Officers on technical phases of procurement of Signal Corps equipment during the period of solicitation and during the life of the contract. Submit resume and the Armed Forces Communications and Electronics Association will forward same immediately to employer who will acknowledge your application direct.

SUPERVISORY GENERAL ENGINEER ($6,950 a year). To serve as an assistant to the military post engineer. Function of the Depot Facilities Division is related to maintenance, care and preservation of all buildings, structures, and rights-of-way and other real estate of the depot; responsible for fire protection and prevention for the depot; and management of depot facilities. Inquiries may be directed to the Civilian Personnel Office, Decatur Signal Depot, Decatur, Illinois.

EAST COAST PICTORIAL CENTER has an opening for a studio electrician at $2.51 an hour. Duties include operating most electrical equipment, required for motion picture production. Knowledge of lighting effects and switchboard wiring required. A position is also available for an architectural draftsman at $4,525 a year. Situation requires ability to execute designs and plans for motion picture settings, and to paint and dress sets, dioramas and other pictorial representations. Clerical duties include filing, developing and printing of blue prints, and a minimum amount of typing. For further information, write to Civilian Personnel Office, Army Pictorial Center, Long Island City, 1, N. Y.

PHYSICIST—GS-9. Qualified expert on radiology responsible for the operation of the film badge service unit and for the monitoring of personnel, material, equipment and radioactive sources. Accountant—GS-9. Responsible for receiving and analyzing all reports generated by the Finance and Accounting Branch; practical application of accounting theories. Cost Accountant—GS-9. Serves as Staff Accountant for the Maintenance Division responsible for performing professional accounting work in connection with cost accounting and Army Industrial Fund activities. Electronic Engineer—GS-7. Responsible for independent accomplishment of professional engineering work as related to research, development, design, evaluation, standardization, modification, etc., of prototype production and fabrication models of electronic equipment. Inquiries should be directed to the Civilian Personnel Director, Lexington Signal Depot, Lexington, Kentucky.

MEDICAL OFFICER GS-12. This position pays $8,645 per annum. The employee will be responsible for the operation of a Federal Civilian Health Service type of dispensary containing examination and treatment rooms and equipment. Examines military personnel having initial responsibility for diagnosis and disposition of cases for treatment. Submit resume and the Armed Forces Communications and Electronics Association will forward same immediately to employer who will acknowledge your application direct.

FORT MONMOUTH VACANCIES

Supv. Physicist (General), GS-14; Electronic Engineer (General), GS-14.

Duty Station: Pasadena, California.

Electronic Engineer (Radio), GS-13.

Duty Station: Christ Church, Hampshire, England.

Electronic Engineer (General), GS-13; *Duty Station:* Fort Monroe, Va., Fort Knox, Ky., Fort Bliss, Texas, and Fort Rucker, Ala. Electronic Engineer (Radio, Instrumentation), GS-12; Chemical Engineer, GS-11; Electronic Engineer (Radio, General & Wire Communications), GS-11: Mechanical Engineer (S&S, Signal Equipment), GS-11; Training Officer (General Fields), GS-11; Mechanical Engineer and Mechanical Engineer (Signal Equipment), GS-9; Employee Utilization Representative, GS-9; Instructor (Radar, Radio-Microwave, Wire Sound Recording), GS-9; Radio & Electronic Equipment Installer and Repairer, WB-15.

U.S. CIVIL SERVICE COMMISSION. Vacancies now exist for Electronic Technician positions in the Civil Aeronautics Administration in Alaska. Starting salaries are $4,080 and $4,525. No written test required. Full information on how to apply may be obtained at many post offices throughout the country or from the U.S. Civil Service Commission, Washington 25, D. C.

U.S. CIVIL SERVICE COMMISSION has announced vacancies for communications cryptographic coding clerks at $3,415 a year. Applicants must have general experience as a clerk, typist, teletypist or telegrapher, plus 6 months of specialized experience in enciphering and deciphering messages, involving the use of a variety of current cryptographic systems and devices. Radio broadcast technician positions are also available in the International Broadcasting Service at $5,915 a year. No written tests required. Further information and application forms from the U.S. Civil Service Commission, Washington 25, D. C.

ELECTRONIC ENGINEERS. Starting salaries $5,335 and $6,115. Electronic Technicians, salaries from $3,670 to $5,440. Vacancies now exist at the Electronics Division of the New York Naval Shipyard, located at Navy and Sands Streets, Brooklyn 1, N. Y. The shipyard is engaged in activities ashore and afloat, including construction of new super-carriers. Direct inquiries to the Industrial Relations Officer, Telephone Main 5-4500, Extension 2877, 2379 or 2593.

FORT HUACHUCA VACANCIES

Supervisory Electronic Engineers (2) GS-855-14, General
Electronic Engineers (2) GS-855-13, General
Electronic Engineer GS-855-13, Instrumentation
Electronic Engineer GS-855-13, Radio
Electronic Engineer GS-855-12, General
Electronic Engineers (2) GS-855-11, General and Radio
Electronic Specialist GS-855-9
Electronic Engineer GS-855-9
Physicist GS-855-9
Supervisory Analytical Statistician GS-1530-12
Mathematician GS-1520-12

ITEMS OF INTEREST

Dreyfus Promoted to Major General

Confirmed by the United States Senate and recently announced by the Chief Signal Officer in Washington is the promotion of Brigadier General James Dreyfus to the rank of Major General.

Since January 1, 1956, General Dreyfus has been Chief of the Procurement and Distribution Division, Office of the Chief Signal Officer. Currently, he is visiting various commands in the Far East.

New National Vice-Chairman of IRE Professional Group

Edward N. Dingley Jr., Chief Communications Engineer of the National Security Agency, has been elected Vice-Chairman of the Institute of Radio Engineers Professional Group on Communications Systems (PGCS).

Mr. Dingley, a member of AFCEA, is a registered Professional Engineer. He is also a member of AIEE, a Fellow of the IRE, and a Naval Reserve Captain. He has been honored with the Defense Department's Distinguished Civilian Service Medal, and is currently serving as Chairman of the Washington Chapter IRE PGCS.

UMI

Now a standard line
POWERSTAT®
VARIABLE TRANSFORMERS for HIGH FREQUENCY APPLICATIONS

— ⅓ the weight — ½ the size of 60 cycle units

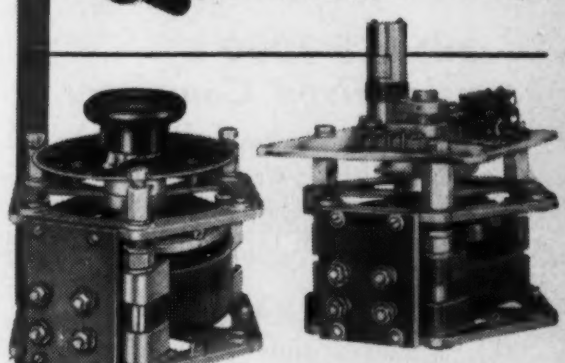
Designed for use in high frequency control systems where weight and space must be minimized, these POWERSTATS are ideal for ship, aircraft, guided missile and other 400/800 cycle applications.

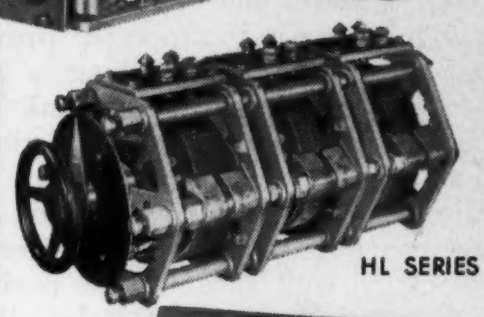
Listed are some of the standard line of POWERSTATS for high frequency applications. However, many high frequency requirements necessitate designing to individual needs. The Superior Electric Company will be pleased to work with you on the design of POWERSTATS to satisfy new or unusual needs.

INPUT		OUTPUT				MANUALLY-OPERATED MODELS				MOTOR-DRIVEN MODELS				
VOLTS	FREQUENCY CYCLES PER SECOND	VOLTS	MAXIMUM AMPERES	MAXIMUM KVA	TYPE OF CONSTRUCTION	TYPE	METHOD OF TURNING	APPROX. WEIGHT (POUNDS) NET	APPROX. WEIGHT (POUNDS) SHIPPING	TYPE	STANDARD MOTOR-DRIVES	SPEED OF TRAVEL IN SECONDS	APPROX. WEIGHT (POUNDS) NET	APPROX. WEIGHT (POUNDS) SHIPPING
SINGLE PHASE														
28	400/800	0–28	2.0	.056	Open	3HS02UK	Knob	0.5	0.9					
28	400/800	0–28	4.0	.112	Open	3HS04UK	Knob	0.8	1.2					
120	400/800	0–120 or 0–140	1.0	.14	Open	1HS01UK	Knob	0.9	1.3					
120	400/800	0–28	2.6	.073	Open	1RHS03UK	Knob	0.6	1.0					
120	400/800	0–120 or 0–140	3.0	.42	Open Square Frame	1HMS03UK	Knob	2.4	2.8	DM1HMS03U	28 Volt D-C	60	4.5	5.1
										AM1HMS03U	120 Volt A-C, 400 Cycles	60	4.5	5.1
120	400/800	0–120 or 0–140	7.5	1.0	Open Square Frame	1HMS07UK	Knob	3.4	3.8	DM1HMS07U	28 Volt D-C	60	5.5	6.1
										AM1HMS07U	120 Volt A-C, 400 Cycles	60	5.5	6.1
120	400/800	0–120 or 0–140	15.0	2.1	Open	1HL15UK	Knob	11.4	14.0	DM1HL15U	28 Volt D-C	60	13.2	16.2
										AM1HL15U	120 Volt A-C, 400 Cycles	60	13.2	16.2
240	400/800	0–240 or 0–280	3.0	.84	Open Square Frame	2HMS03UK	Knob	3.4	3.8	DM2HMS03U	28 Volt D-C	60	5.5	6.1
										AM2HMS03U	120 Volt A-C, 400 Cycles	60	5.5	6.1
240	400/800	0–240 or 0–280	9.0	2.5	Open	2HL09UK	Knob	12.8	15.4	DM2HL09U	28 Volt D-C	60	14.6	17.6
										AM2HL09U	120 Volt A-C, 400 Cycles	60	14.6	17.6
THREE PHASE														
240	400/800	0–240 or 0–280	3.0	1.5	Open	2HMS03UK-3Y	Knob	7.6	8.5	DM2HMS03U-3Y	28 Volt D-C	60	9.3	10.5
										AM2HMS03U-3Y	120 Volt A-C, 400 Cycles	60	9.3	10.5
240	400/800	0–240 or 0–280	7.5	3.6	Open	2HMS07UK-3Y	Knob	10.6	11.6	DM2HMS07U-3Y	28 Volt D-C	60	12.3	13.6
										AM2HMS07U-3Y	120 Volt A-C, 400 Cycles	60	12.3	13.6
240	400/800	0–240 or 0–280	15.0	7.3	Open	2HL15UK-3Y	Knob	34.5	41.0	DM2HL15U-3Y	28 Volt D-C	60	38.0	45.0
										AM2HL15U-3Y	120 Volt A-C, 400 Cycles	60	38.0	45.0
480	400/800	0–480 or 0–560	3.0	2.9	Open	4HMS03UK-3Y	Knob	10.6	11.6	DM4HMS03U-3Y	28 Volt D-C	60	12.3	13.6
										AM4HMS03U-3Y	120 Volt A-C, 400 Cycles	60	12.3	13.6
480	400/800	0–480 or 0–560	9.0	8.7	Open	4HL09UK-3Y	Knob	39.0	45.5	DM4HL09U-3Y	28 Volt D-C	60	42.5	49.5
										AM4HL09U-3Y	120 Volt A-C, 400 Cycles	60	42.5	49.5

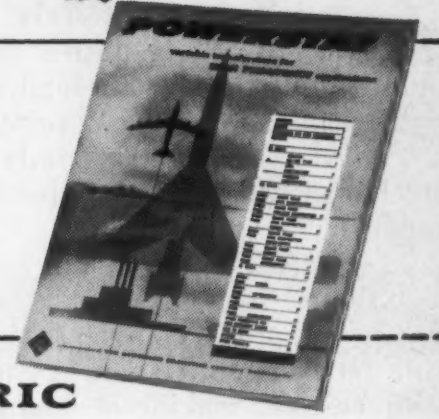
HS SERIES

HM SERIES





HL SERIES



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Send new Bulletin P257H ☐ Have your representative call ☐

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NEW PRODUCTS FROM INDUSTRY

Electronic Larynx

Rand Development Corp. has developed an electronic larynx which will allow persons without vocal chords to talk.

The transistorized unit which consists of a small speaker case and a plastic tube, can generate a composite sound ranging from 80 to 6,000 cycles simultaneously. It has a built-in speaker attached to the one-eighth inch diameter plastic tube leading to the mouth.

Words are formed by the mouth of the person wearing a unit, and sound, which includes the overtones, is audible through the speaker. A unit is small enough to be worn in a vest pocket or on a necklace.

James H. Rand, president of the company, said that the electronic larynx, which is the smallest vocal chord in the world, will be marketed commercially in several months and will retail for about $300.

"Transac S-1000" Transistorized Computer

The Philco Corp. of Philadelphia, Pa., now offers a large-scale electronic computer for scientific application in research labs, industries and universities.

The Philco TRANSAC, Type S-1000, features new speeds and extensive command structure, providing for the solution of lengthy and complex mathematical problems. The transistors used require no periodic replacement, and the transistor circuitry eliminates bulky insulation and the heavy power supply equipment associated with vacuum tube devices.

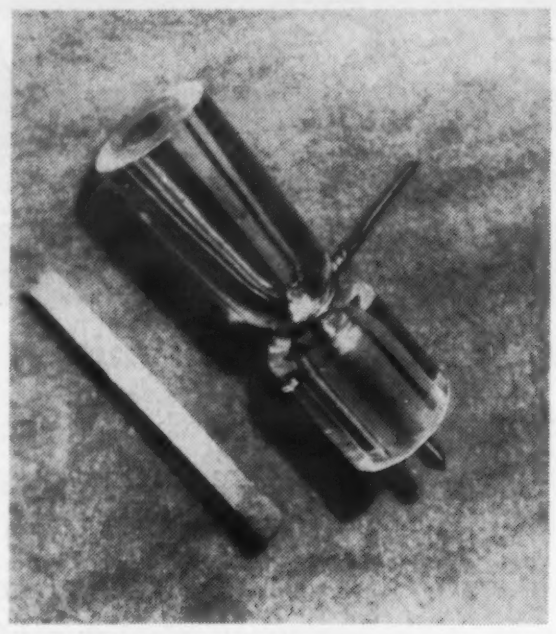
Generating comparatively little heat, the S-1000 requires only a small fraction of the air-conditioning equipment normally required for large-scale computers—only the amount of cooling needed for human comfort.

The TRANSAC computer needs no installation work or special wiring. It may be plugged into existing 110 volt, 60 cycle outlets and is equipped with casters, making it highly mobile.

Radiotelephone for Field Work

A new portable AM radiotelephone has been announced by Kaar Engineering Corp., Box 1320, Palo Alto, Calif.

Designated the TR 246 Packset, the new unit was developed to provide reliable field communications in terrain where VHF equipment is impractical—in oil exploration, geological survey, mining, foreign construction, etc.



A small quartz cell, the size of a peanut shell, is the heart of the new "Ionovac," an invention of the DuKane Corp., St. Charles, Ill. The device uses ionic clouds to replace diaphrams in loudspeakers and to beam ultra-sonic (silent sound) waves for industrial, therapeutic and research purposes.

The Packset provides approximately two watts of output power in the 2 to 8 mc. frequency range. Its power is obtained from three 1.5 volt "A" batteries, three 4.5 "B" batteries, and two 7.5 "C" batteries.

Special features include built-in metering facilities, receiver noise limiter, and squelch system. The Packset is entirely self-contained in a watertight canvas backpack and has a base-loaded, telescoping, 16-foot antenna to insure maximum portability. Measurements are 12" x 6" x 11⅜", and weight, including full complement of batteries, is 23 lbs.

New "Radio Pill" for Medical Research

A new 1"-long "radio pill" containing a tiny FM radio station will broadcast news to medical researchers on gastro-intestinal ills.

The new "pill" is an easily swallowed plastic capsule containing a tiny transistor, an oscillator, a ferrite cup inductance core and a minute, replaceable storage battery which powers the oscillator and lasts for 15 hours. The oscillator is so sensitive that its frequency varies with changes in the pressure to which the "pill" is exposed, sending out FM signals which are picked up on an outside FM radio receiver. The "pill" may be manipulated through the body by means of outside magnetic forces, and its course may be traced by fluoroscopy.

The main purpose of the "pill" is to give information on pressures and muscular contractions in the intestinal tract, and it may prove useful in revealing acidity and temperatures. It is designed to study human digestion and absorption under both normal and pathological conditions. Also, it is hoped that the "radio pill" will aid researchers in gaining knowledge about the muscular activity of the right side of the colon, heretofore almost inaccessible for study. This knowledge may prove useful in understanding the pathological physiology of such ailments as spastic colitis, ulcerative colitis and other organic and functional disease conditions.

The "radio pill" was designed by Dr. V. K. Zworykin, as it had been envisioned by Dr. John T. Farrar, and it has been developed and tested jointly by the Rockefeller Institute, the New York Veterans Administration Hospital and the Radio Corporation of America. At present, the "pill" is being used experimentally.

Power Supply Unit and Field Test Set

Two new proprietary products, a missile airborne power supply unit and the Model 604 field test set for AN/ARC-34 radio sets, are now available from the Cal-Tronics Corp., Los Angeles, Cal.

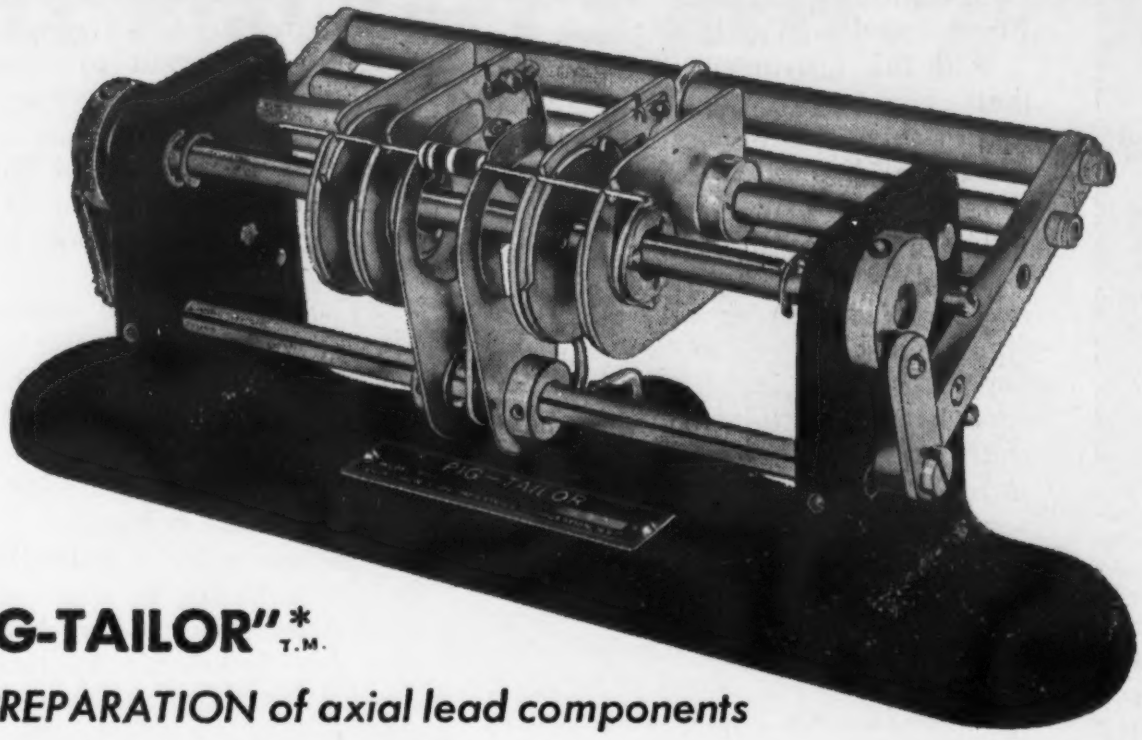
The missile unit is used to furnish power to a missile prior to release. It plugs into the aircraft system, modifying the electrical power to the proper requirements. The unit is potted with a plastic lock-foam which solidifies it in a metal container to withstand vibration or shock.

Model 604 field test set for commercial airlines provides a systematic means of completely checking the operation of the airplane's communication set. Designed in three units to match those of the radio set, it tests out the remote system, the frequency generator or monitor and the mechanical tuning system. According to Cal-Tronics' engineers, a complete check can be made in approximately one hour.

(*Continued on page* 146)

UMI

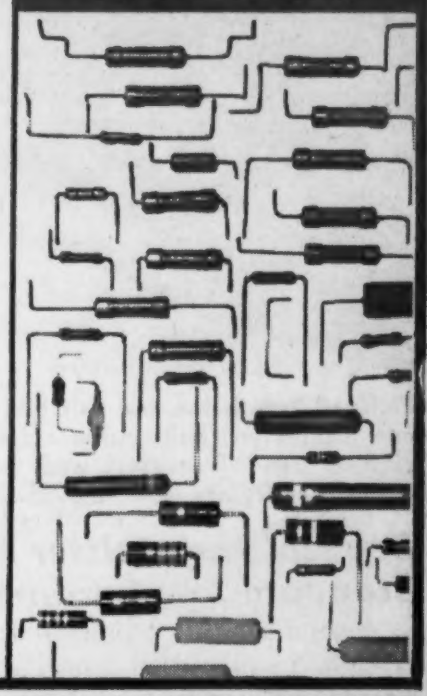
PROVEN-on the assembly line!



"PIG-TAILOR"* T.M.

For PREPARATION of axial lead components

PREPARED COMPONENTS IN SECONDS WITH THE "PIG-TAILOR"



"PIG-TAILORING"

. . . . a revolutionary new mechanical process for higher production at lower costs. Fastest PREPARATION and ASSEMBLY of Resistors, Capacitors, Diodes and all other axial lead components for TERMINAL BOARDS, PRINTED CIRCUITS and MINIATURIZED ASSEMBLIES.

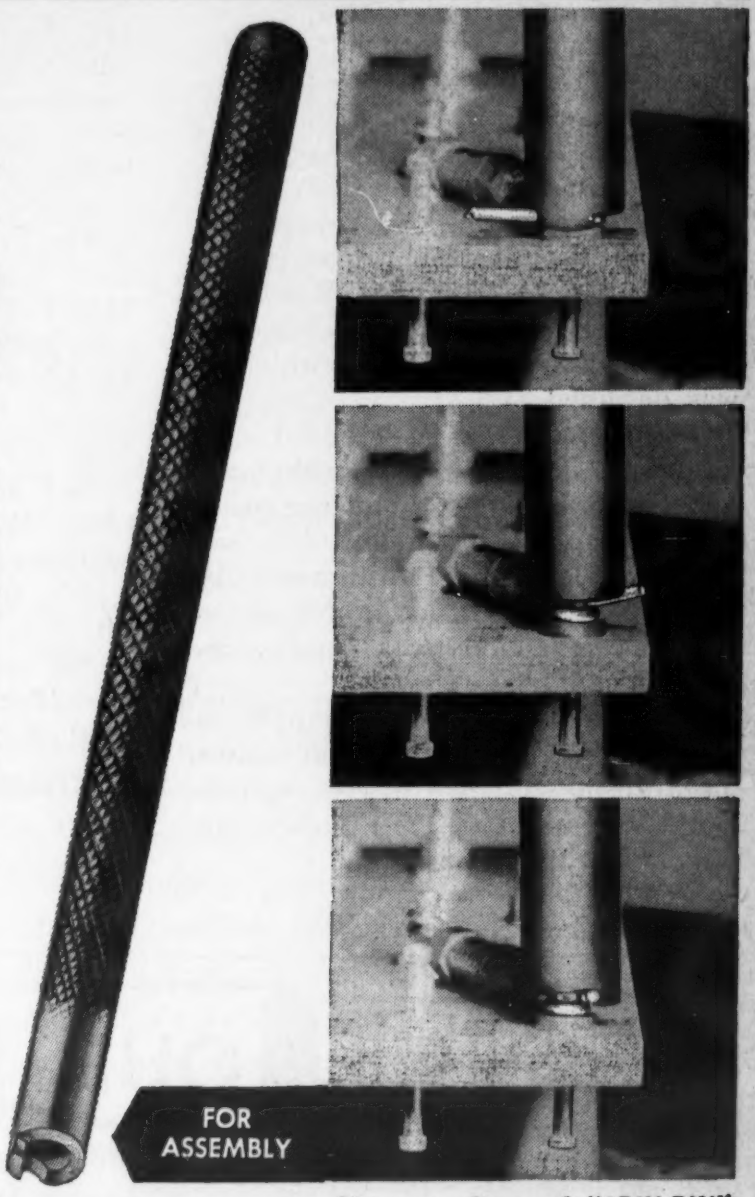
The "PIG-TAILOR" plus "SPIN-PIN"—accurately MEASURES, CUTS, BENDS, EJECTS & ASSEMBLES both leads simultaneously to individual lengths and shapes—3 minute set-up—No accessories—Foot operated—1 hour training time.

PIG-TAILORING provides:

1. Uniform component position.
2. Uniform marking exposure.
3. Miniaturization spacing control.
4. "S" leads for terminals.
5. "U" leads for printed circuits.
6. Individual cut and bend lengths.
7. Better time/rate analysis.
8. Closer cost control.
9. Invaluable labor saving.
10. Immediate cost recovery.

PIG-TAILORING eliminates:

1. Diagonal cutters!
2. Long-nose pliers!
3. Operator judgment!
4. 90% operator training time!
5. Broken components!
6. Broken leads!
7. Short circuits from clippings!
8. 65% chassis handling!
9. Excessive lead tautness!
10. Haphazard assembly methods!



"SPIN-PIN"* T.M. Close-up views of "SPIN-PIN" illustrate fast assembly of tailored-lead wire to terminal.

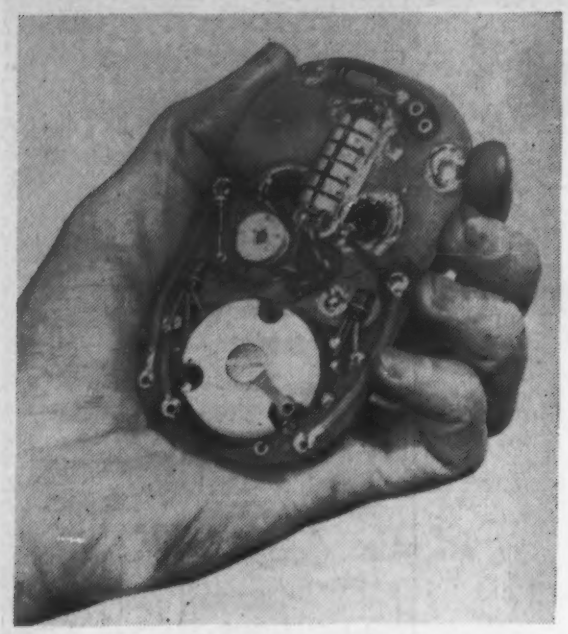
* PATENT PENDING

Write for illustrated, descriptive text on "PIG-TAILORING" to Dept. S-5P

BRUNO-NEW YORK INDUSTRIES CORPORATION

DESIGNERS AND MANUFACTURERS OF ELECTRONIC EQUIPMENT

460 WEST 34th STREET • NEW YORK 1, N. Y.



Pictured here is the new Fairchild UHF beacon transmitter, built inside a standard size sardine can. Transistors and printed circuitry are used throughout.

Beacon Transmitter Fits in Standard Size Sardine Can

A completely transistorized UHF beacon transmitter, small enough to fit into a standard size sardine can, has been announced by the Electronics Division of Fairchild Controls Corp., Syosset, L.I., N.Y.

Using a Kel-f laminate for its printed circuit, the transmitter is designed to send radio signals a distance of 25 miles continuously for 24 hours. It can be modified for voice or code operation at frequencies other than the 280-322 mcs. for which it was designed.

The output feeds a standard subminiature 50 ohm coaxial cable, attached to a simple self-erecting quarter-wave antenna radiator. The antenna is housed in a hermetically sealed tube only 12″ long, but is exploded into action by a small gunpowder charge.

A toroidal type power supply is built into the sardine can that houses the transmitter. Size of the can is 2-3/4″ x 4-5/16″ x 1″. Finished can weighs less than 8 oz.

Television Line Selector

A new television line selector (Type L.196) is offered by Mullard Ltd., Mullard House, Torrington Place, London W.C.1, England.

With this instrument, it is claimed that any conventional triggered oscilloscope can be used to give a jitter-free display of one or more lines of a television video signal.

The output of the line selector is a sharp-fronted 30V pulse, which can be delayed with respect to the frame pulse by up to 2.5 milliseconds. The delay is "stepped" in synchronism with the line pulse, and coarse and fine delay controls are incorporated for easy selection of the required display.

New Test Instrument Kits

A new line of electronic test instruments in kit form has been announced by Paco Electronics Co., Inc., 70-31 84th St., Glendale, L.I., N.Y.

The kits are expected to find wide application in radio and TV servicing, hi-fi custom building and service, electronic hobbies and amateur radio, science education and technical schools, as well as industrial testing and quality control.

The first five kits in the Paco line, now ready for shipment, are: The Model B-10 battery eliminator kit, with both 6 and 12 volt outputs; the Model C-20 resistance-capacity-ratio bridge kit, with capacity ranges from 10-2,000 mmfd and resistance ranges from 0.5 ohms to 200 megohms; the Model S-50 5″ cathode-ray oscilloscope kit, with 1 Mc bandwidth; the Model T-60 tube checker kit, with free-point lever element selector system; and the Model V-70 vacuum-tube voltmeter kit, with a total of 21 ranges.

Ultrasonic Flaw Tester

An ultrasonic flaw tester, which gives three simultaneous pictures of the matter being tested, can find flaws in any metallic material.

Mr. Benson Carlin, President and Chief Engineer of Alcar Instruments, Inc., Little Ferry, N.Y., described this $25,000 instrument to members of the Society for Nondestructive Testing. He said that it was originally developed for use at the Watertown, N.Y. Arsenal, where it is finding flaws in 14-inch armor plate for Army tanks.

By utilizing sound waves in the ultrasonic frequencies, the instrument is able to detect and plot flaws. Not only is it electronically simple to operate, but no computation procedures are necessary in order to read presented data correctly.

The flaw tester is militarily useful in testing metals in airplanes, ships, guided missiles, and rockets, but it also has industrial applications in the inspection of steel castings and pressure vessels. Mr. Carlin said that the instrument has not yet been placed in production for industrial uses, but will be if there is a demand.

Instrument Display Projector

A new and successfully tested development in simplified aircraft cockpit instrumentation has been announced by Autonetics, 9150 E. Imperial Highway, Downey, Cal.

Called the Instrument Display Projector, the compact device provides at a glance essential information to pilots for completing an instrument landing, while at the same time allowing visual contact outside the airplane.

Components are a miniature-type cathode ray tube, a mirror system, collimating optics (which make light rays parallel), and a trichroic combining glass using a color contrast principle to enhance definition of the reflected image.

With the color separation principle and cathode ray tube, the instrument can obtain suitable image definition against a bright sky background.

Since the display is focused to infinity, flight data reproduced on the cathode ray tube appear to the pilot as a bright image suspended in space. As a result, the pilot has no eye accommodation problem; he need not transfer his visual attention from the tube image to objects outside the airplane.

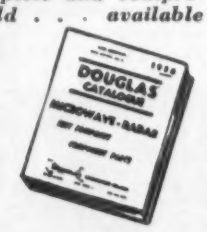
The Instrument Display Projector requires only about 4,000 volts to obtain necessary image brightness—five times less than that needed by conventional cathode ray tube systems. (*Continued on page* 148)

SEE OUR NEW

Hi-Directivity Broadband Coaxial Directional Couplers

Continuously Variable Broadband Coaxial Attenuator

- *Write for our Component Catalogue, it is the most complete and comprehensive in the field . . . available on request.*



"Unique in the Microwave Field"

Booth 54—AFCEA Show

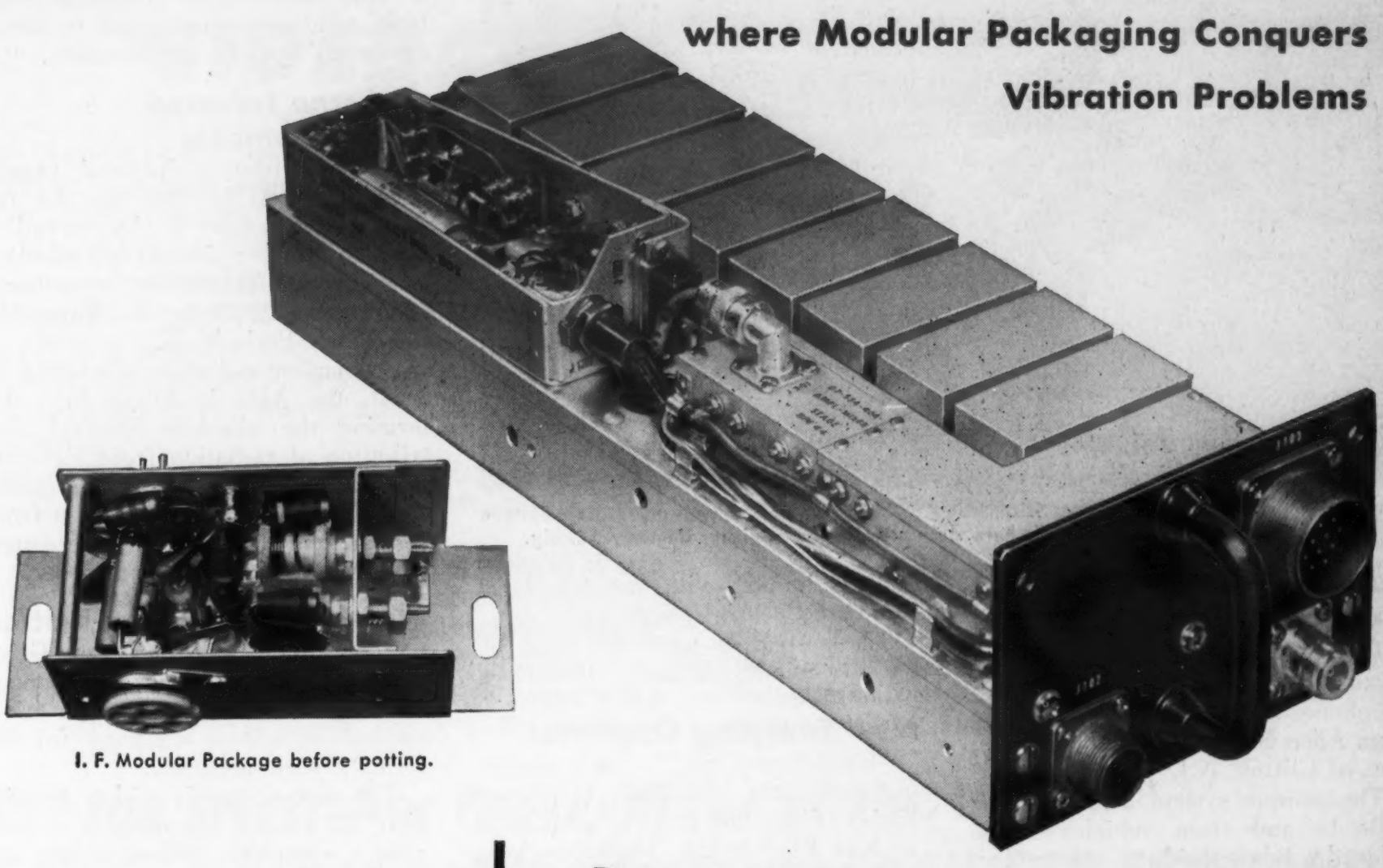
DOUGLAS MICROWAVE CO., INC.

252 E. Third St. Mt. Vernon, N.Y.

Introducing . . .

BELL AIRCRAFT'S NEW 400 mc RECEIVER

where Modular Packaging Conquers Vibration Problems



I. F. Modular Package before potting.

ELECTRICAL SPECIFICATIONS

Type: FM 300 KC Deviation

Tuning Range: 406 to 420 megacycles Plug-in assemblies to extend range to 500 mcs available

Oscillator: Crystal controlled

Sensitivity: 5 microvolts or better for 10 db quieting

Input Impedance: 50 ohms

Bandwidth: 1.15 mcs ±.1 at 3 db

Image and Spurious Response: Better than 60 db

Output: ±0.5 db 40 cps to 40 kc 3 db at 100 kc 3.5 volts RMS 500 ohms closed circuit

Squelch: Adjustable squelch relay from 10 to 100 microvolts input

Power Input: Less than 50 watts. Power supplies available for 400 cycles per second 115V or 28VDC

MECHANICAL SPECIFICATIONS

Dimension: 3.6 x 5.5 x 15.25 inches. Volume 300 cubic inches

Weight: 10 pounds

Mounting: Solid mounting 9 mounting screws

Operating Environments: 15g's 5 to 2000 cycles -55° to +72°C

Bell Aircraft's recent breakthrough in Modular Packaging Techniques was utilized in this rugged, 400 megacycle receiver designed to meet the exacting vibration requirements of Bell's own missiles and guidance systems. It is immediately available for commercial or military applications where demodulated control signals for the activation of any communications system requiring a high signal-to-noise ratio, high sensitivity, high stability, and a wide audio bandwidth with low harmonic and phase distortion are needed. The receiver is equally efficient as a radio controlled receiver for guided missiles...as a ground telemetering instrument...or as either a ground or airborne communications receiver.

The modular construction of the plug-in units in this revolutionary new 400 megacycle receiver also facilitates fast, easy servicing. A comparable 500 megacycle receiver is in the final stages of development.

This is but another example of the engineering imagination of Bell Aircraft's Avionics Specialists in solving tomorrow's complex problems today.

For complete information on these receivers or any other avionic units, systems or components write, wire or phone: Sales Manager, Avionics Division, BELL AIRCRAFT CORP., Post Office Box One, Buffalo 5, N. Y.

WELCOME A. F. C. E. A. MEMBERS AND GUESTS to the exhibit of Bell Aircraft's Avionics Division, Booth 97-98...and to our Hospitality Suite at the Sheraton Park Hotel.

BELL Aircraft CORP.

Avionics Division
BUFFALO, N. Y.

Simple dialing procedure for using automatic "dial-direct" mobile two-way radiotelephone system, developed by Du Mont, is here demonstrated by engineer James A. Craig.

Automatic Mobile Radiotelephone System

The first completely automatic "dial-direct" mobile two-way radiotelephone system is now available from Allen B. Du Mont Laboratories, Inc., of Clifton, N.J.

The unique system allows phone calls to and from vehicles to be relayed, completely unattended, through local telephone systems. Unlike other radiotelephone systems, it operates on a 24-hour basis, requiring no manual operators.

Calls are made by dialing a number within a local telephone system; also, anyone within the system may call a vehicle in the same manner. A long distance operator must be contacted for the placing of toll calls only.

It is believed that the low cost of the system will open radio-telephone service to the general public, to truck and other vehicle fleet operations, to boats, and to rural radiotelephone installations in isolated areas.

The system consists of a dial radiotelephone in a vehicle, employing a 2-way radio system as a carrier to the local telephone company installation. A transmitter-receiver base station is also interconnected with the local telephone system. Termination and switching equipment at the base station automatically transfers the radio calls to the telephone system and vice versa. Calls can also be made from vehicle to vehicle. Only two telephone lines—one for telephone-to-radio calls, the other for radio-to-telephone calls — are required to interconnect the base station equipment with the telephone company's central office.

The system is presently used by the Richmond, Indiana Radiotelephone, Inc.

New Sweeping Oscillator

"Rada-Sweep Sr.," a new sweeping oscillator designed to sweep Radar IF's to 280 mcs., is announced by Kay Electric Co., 14 Maple Ave., Pine Brook, N.J.

A broad-band, all-electronic fundamental sweeping oscillator with six switched bands, the new Rada-Sweep Sr. has 24 precise crystal markers set at customer-specified frequencies. Center frequencies are from 1 to 260 mcs. The company states that the unit features all the advantages of the Rada-Sweep plus the integral design of the Vari-Sweep. It is very stable, has low harmonic content and is free of spurious output.

The new oscillator's dimensions are: Standard 8¾" x 19" rack panel, 10" deep, and its weight is approximately 45 lbs. It is suitable for rack mount and can be supplied with a cabinet.

Lightweight Telemetering Filters

The Pacific Coast Division of Aerovox Corp., 2724 Peck Road, Monrovia, Cal., has announced a new line of subminiature, lightweight telemetering filters for missile applications.

The remarkably small size of these filters is 2 cubic inches or less per unit. Telemetering filters for channels 1-6 weigh only 71 grams; channels 7-18 weigh 36 grams.

Completely cast in an epoxy-filled resin, all units are hermetically sealed and are said to meet all applicable MIL specifications for immersion, shock and environmental tests. Temperature range is —55°C to +85°C. Standard input impedance is 20K and output impedance is 100K. This can be varied to meet customers' specific requirements.

Airborne Infrared Monochromator

A new airborne infrared monochromator (AIM) that can be installed in a bomber to observe radiations from other aircraft and missiles is being manufactured by Servo Corp. of America, 20-20 Jericho Turnpike, New Hyde Park, N. Y.

A complete radiation laboratory in itself, the AIM is designed to determine the absolute spectral distribution of radiation from airborne targets in the 1.5-25 micron region, to determine the total radiation from targets, and to record these measurements on a two-channel recorder.

New System of Navigation

Sperry Gyroscope Co. of Great Neck, L.I., N.Y., has announced CYTAC, a new long-range radio navigation system designed for extremely high accuracy.

The new system is said to require only 15 ground transmitters to provide a complete, 24-hour-a-day, all-weather air and sea navigation umbrella over the entire U.S.A. and adjacent sea lanes. CYTAC, reported to be up to 10 times more accurate than presently used systems, is the first navigation system having the range and accuracy for common use by helicopters, and transcontinental or transoceanic planes and ships. The standard LORAN system. developed during World War II and now in use, can be adapted for CYTAC with a simple, two-tube frequency converter.

The proposed system, until recently a highly classified military project, may be a step toward solving the Nation's civil air and sea lane traffic problem.

Scriber for All Surfaces

Arch Crown Tags Inc., Newark, N.J., announces the "Perma-Scribe," a marking stylus featuring a newly developed point for inscribing a permanent marking, writing or identification on almost any surface.

Shaped and used like an ordinary pen, the stylus point is designed with cutting edges that cover the base and side in a radial pattern, producing a flowing mark on metals of all degrees of hardness, all types of plastics and

(*Continued on page* 150)

UMI

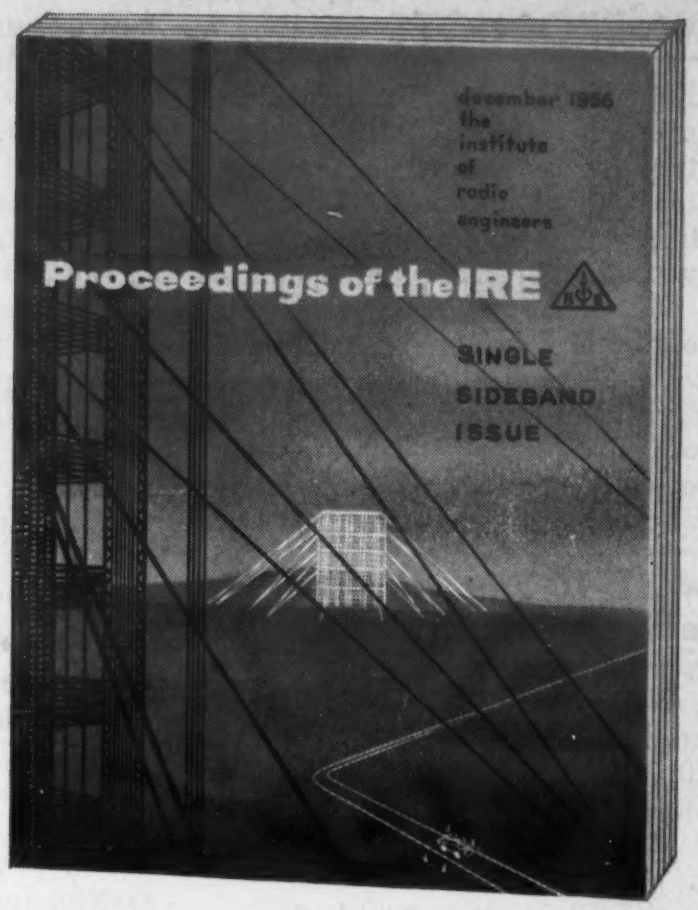
IRE reports on SINGLE SIDEBAND!

The December issue of **Proceedings of the IRE** presents a round-up of the most recent technical discoveries as presented by the Joint Technical Advisory Committee through its sub committee on single sideband techniques.

Because single sideband offers advantages over conventional AM systems for police radios, taxi radios, ship to shore radios, as well as in many other practical uses, the JTAC has launched a special study for the FCC on this new development in radio communication. Interest in single sideband systems is high because they:

1. **Reduce the size and weight of equipment, allow effective communication when conditions limit the size of the installation.**
2. **Conserve the radio spectrum by not taking up as wide a band of frequencies as do AM signals.**
3. **Permit a reduction in the total radiated power required to accomplish a given communication function.**

The December issue of **Proceedings of the IRE** begins with a guest Editorial by the Honorable George C. McConnaughey, Chairman of the Federal Communications Commission and will take its place in the record of radio-electronics growth. IRE gave you the color TV issues of October, 1951, and January, 1954, the scatter propagation issue of October, 1955, the earth satellite issue of June, 1956, and now December's special single sideband issue—a reference work of the decade!



Get the December Proceedings of the IRE and get the facts about SINGLE SIDEBANDS

Partial list of contents:

"Factors Influencing Single Sideband Receiver Design" by L. W. Couillard, Collins Radio Co., Cedar Rapids, Iowa

"Frequency Control Techniques for Single Sideband" by R. L. Craiglow, E. I. Martin, Collins Radio Co., Cedar Rapids, Iowa

"A Suggestion for Spectrum Conservation" by R. T. Cox, E. W. Pappenfus, Collins Radio Co., Cedar Rapids, Iowa

"Power and Economics of Single Sideband Equipment" by E. W. Pappenfus, Collins Radio Co., Cedar Rapids, Iowa

"Automatic Tuning Techniques for Single Sideband Equipment" by V. R. DeLong, Collins Radio Co., Cedar Rapids, Iowa

"Linear Power Amplifier Design" by W. B. Bruene, Collins Radio Co., Cedar Rapids, Iowa

"Distortion Reducing Means for Single Sideband Transmitters" by W. B. Bruene, Collins Radio Co., Cedar Rapids, Iowa

"Linearity Testing Techniques for Sideband Equipment" by P. J. Icenbice, H. E. Fellhauer, Collins Radio Co., Cedar Rapids, Iowa

"Early History of Single Sideband Transmission" by A. A. Oswald, (retired) formerly Bell Telephone Labs., Inc., Murray Hill, N. J.

"Comparison of Linear Single Sideband Transmitters with Envelope Elimination and Restoration Single Sideband Transmitters" by L. R. Kahn, Kahn Research Labs., Freeport, L. I., N. Y.

"Application of Single Sideband Technique to Frequency Shift Telegraphy" by C. Buff, Mackay Radio & Telegraph Co., Inc., Brentwood, L. I., N. Y.

"A Third Method of Generation and Detection of Single Sideband Signals" by D. K. Weaver, Stanford Research Institute, Stanford, Calif.

"An Introduction to Single Sideband Communications" by J. F. Honey, Stanford Research Institute, Stanford, Calif.

"Synchronous Communications" by J. P. Costas, General Electric Co., Syracuse, N. Y.

"Synthesizer Stabilized Single Sideband System" by B. Fisk, C. I. Spencer, Naval Research Lab., Washington, D. C.

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The Institute of Radio Engineers

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wood surfaces, glass, and rubber linoleum. It is said to retain its ability to inscribe for long periods of time without appreciable wear.

The stylus is claimed to be especially useful for the plastics industry, for identification marks on photographic film, for the recording, optical and medical fields, for machinery identification, on jewelry, mirrors, appliances—wherever a permanently inscribed mark or scratch must be made into a surface.

New ST-10 Aids High Fidelity Systems

David Bogen Co., Inc., of Paramus, New Jersey, has recently announced the introduction of Model ST-10, a moderately-priced facility for the enjoyment of stereophonic tape playback in high fidelity systems.

The ST-10 incorporates dual preamplifiers and a 10-watt amplifier in a single compact unit, plus volume control and tone control.

This addition to the Bogen line now makes possible conversion to stereophonic reproduction utilizing inexpensive tape decks without preamplifiers. It has a shipping weight of 11 pounds and is available with cage and legs.

Amperex UHF Twin Tetrode

Amperex Electronic Corporation claims that its new Type 6939 twin-tetrode is the world's smallest UHF twin tetrode.

With a seated height of only 2-9/32 inches, the Amperex 6939 is said to be the only miniature tube that delivers 5.5 watts useful power in the load (ICAS rating) at any frequency up to 500 megacycles.

The performance of the Amperex 6939 is due mainly to its exclusive "Frame-Grid" construction, insuring extreme accuracy of inter-electrode. The 6939's special characteristics often permit the elimination of entire stages in original equipment design, resulting in lowered manufacturing costs.

For further information, write to: Communications Tube Division, Amperex Electronic Corp., 230 Duffy Avenue, Hicksville, L.I., N.Y.

3-Dimensional Flux Meter

A unique three-dimensional flux meter, which measures the strength of a magnetic field along each of its three rectangular axes, is now offered by the Federal Telephone and Radio Co., Clifton, N.J.

Federal states that the new meter measures three magnetic spatial components instead of the single component measured by most meters. It is equipped with a long thin probe permitting convenient measurements in narrow spaces. It is light, compact, portable and simple to use.

The 3-D flux meter is essentially a d-c generator, and its sensing elements are two armatures, in the form of small measuring coils, which rotate at 3600 rpm in the magnetic field being measured. By means of a special commutator arrangement, one of the coils senses both the X and Y axis of the field while the second is used to sense the Z axis.

Automatic Radar Performance Monitor

Airborne Instruments Lab., Mineola, N.Y., announces a new radar performance monitor that continuously and automatically presents on meters the r-f parameters of a radar system, i.e., noise figure, transmitter power and relative tuning.

The equipment monitors these parameters during normal operation of the radar without affecting system performance, and it can be adapted either for permanent installation as part of the radar or for such applications as pre-flight checkout of airborne radar in aircraft or missiles.

The system consists in part of 3 precision directional couplers, one for injecting noise from a standard argon discharge noise generator, a second for measuring forward power and a third for measuring reverse power. A separate i-f amplifier channel and video detector system develops two voltages, one proportional to system noise and the other proportional to system noise plus generator noises. This difference in voltage is then measured with a stable vacuum tube voltmeter.

Power is measured with a temperature compensated power bridge and presented on a meter. Comparison of forward and reverse powers produces a VSWR reading on the same meter. Relative tuning is produced by a meter indication on the discriminator in the AFC channel of the system. The relative noise figure of the crystal in use can also be indicated utilizing the normal crystal current meter when the transmitter is off.

New Literature

Booklet on Industrial Motion Pictures

A new Kodak booklet, "Industrial Motion Pictures," is now available from Kodak dealers at a price of 50¢.

The 76-page booklet, an optional addition to the Kodak Industrial Handbook, gives the industrial photographer the information he needs to produce low-cost films, plus complete data on all 16mm Kodak motion picture films.

Fully illustrated and prepared after extensive research with industrial companies, the booklet outlines the planning, writing, shooting, editing, processing and titling of industrial motion pictures.

Price List of AEC Reports

A new free price list of AEC unclassified research reports is now available from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D.C.

This listing of the more than 3,600 AEC reports in the OTS collection contains 454 items acquired since June 30, 1956. To obtain the new list, request AEC Research Reports Price List No. 27. The next list will be available in August, 1957.

Radiation Protective Equipment Folder

A brochure on radiation protection material for X-ray and radioscope applications is available free of charge from Ameray Corp., Route 46, Kenvil, N.J.

The 4-page illustrated folder describes the company's lead insulated lathe, blocks, panels and screens as well as lead doors, pass boxes, light-proof shades and protective windows. Also included are descriptions of control windows, louvers and fume hoods.

New Bulletin on Resistors

International Resistance Co., of 401 N. Broad St., Philadelphia 8, Pa., now offers its new Catalog Data Bulletin C-1b on tubular and flat power wire wound resistors.

12 pages of comprehensive data are given on construction, characteristics, coating, winding, insulation identification, mechanical strength, terminals and brackets. Detailed charts and graphs are included in the bulletin.

Radiography on Subminiature Tubes

A new 6-page bulletin, "Radiography in Production Control and Inspection of Subminiature Tubes," is available from the Instruments Division, Philips Electronics, Inc., 750 S. Fulton Ave., Mount Vernon, N.Y.

Reprinted from a national technical magazine, the article deals with the basic requirements for precision radiography and describes techniques used by Raytheon Manufacturing Co. Explanatory drawings and photographs are included.

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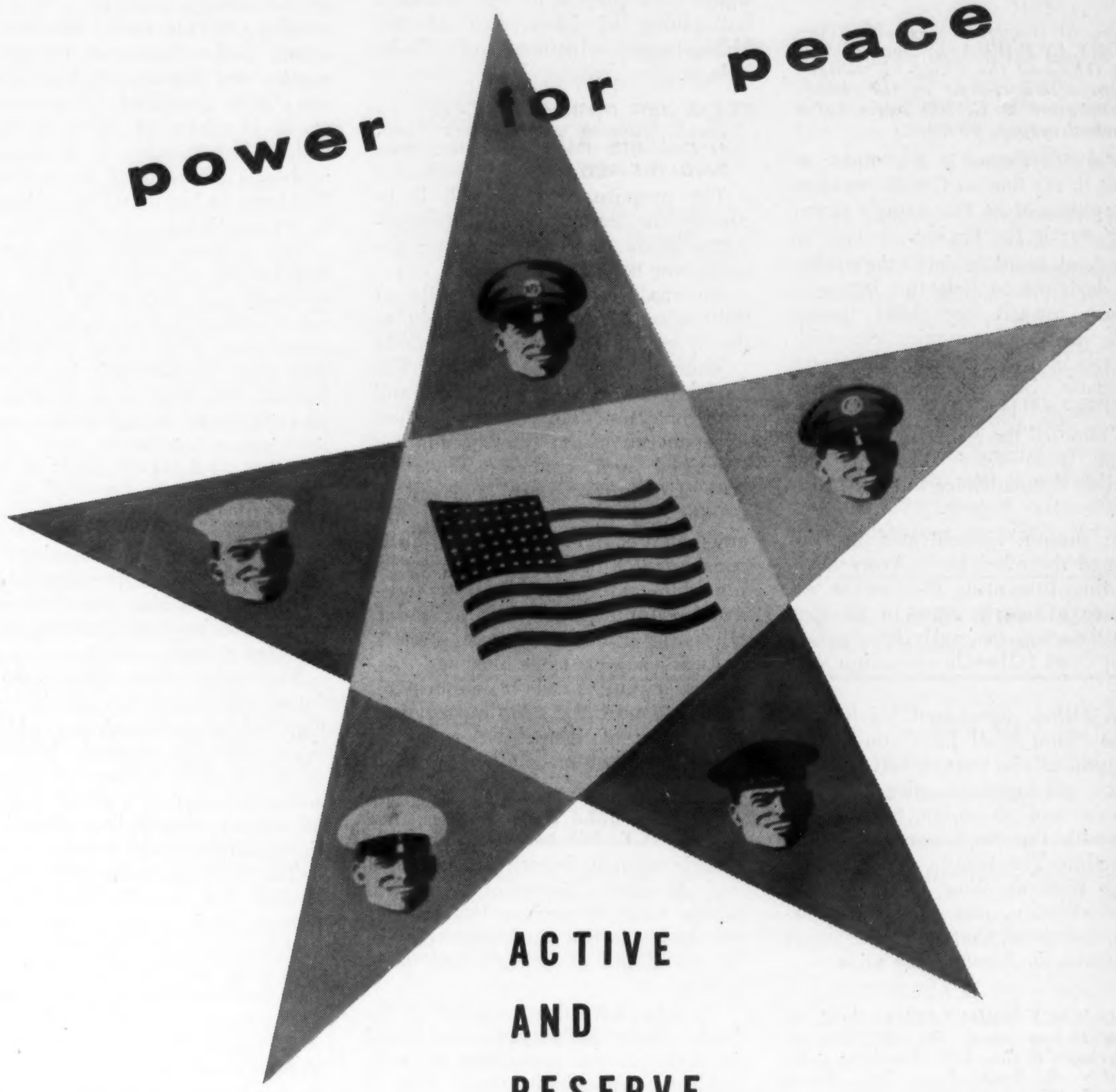

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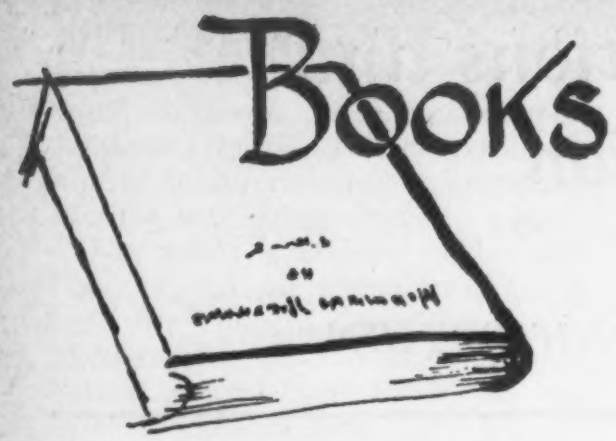

VICTORY IN PAPUA, by Samuel Milner. Office of the Chief of Military History, Department of the Army, Washington, D. C. 409 pages (plus attached maps), $6.00.

Victory in Papua is a companion volume to the one on Guadalcanal in the Department of the Army's series on the war in the Pacific.

The book treats in detail the operations designed to halt the Japanese advance toward the vital transpacific line of communications with Australia in order to secure Australia as a base. Success in Papua and Guadalcanal, gained in February, 1943, enabled the Allies to neutralize Rabaul and, after this was accomplished, to advance to the Philippines.

The author concentrates on the action of the 32nd U. S. Army Division, thus presenting the combat experience of small units in sharper focus than has generally been possible in most full-scale campaign volumes.

Mr. Milner has based his history of the "long cruel fight" on a rich variety of official records—U.S., Australian, and Japanese—plus many interviews and extensive correspondence with the chief participants in the action. The results of his painstaking research show in the wealth of information, plus ample illustrations and maps, that make the pages of *Victory in Papua* come alive.

FREQUENCY MODULATION, by L. B. Arguimbau and R. D. Stuart. Methuen & Co., Ltd., London; John Wiley & Sons, Inc., New York. $2.00, 96 pages.

In its discussion of the frequency-modulation system as developed by Armstrong, this book places primary emphasis on the system's most useful feature: reducing the effect of extraneous disturbances introduced during transmission.

The authors state that the improvement is achieved by utilizing changes of instantaneous frequency which are large in comparison with those occurring naturally. The concept of changing instantaneous frequency is given great importance, and in the light of this concept, much detailed circuitry has been discussed.

The book states that attempts to make rapid changes in frequency give rise to circuit response problems restricting the naive concepts of instantaneous frequency. These problems are studied in terms of spectra.

The writers explain that this monograph is mainly based on experience which they gained in the Research Laboratory of Electronics of the Massachusetts Institute of Technology.

PULSE AND DIGITAL CIRCUITS, by Jacob Millman and Herbert Taub. McGraw-Hill Book Co., Inc., New York, N.Y. 687 pages, $12.50.

The purpose of this book is to present the important new developments in the field of electronic circuits over the past ten years.

An analysis is made initially of the response of linear networks to the types of waveforms commonly encountered in pulse circuits. The basic non-linearites of tubes and semiconductor devices and their effect on waveform transmission are described and studied. Waveform generating circuits are analyzed in detail, and other fundamental circuits and components are carefully considered. Finally, the basic building blocks are assembled into pulse and digital systems such as radar, television, and digital computers.

Each chapter assembles and correlates circuits and techniques required to perform a basic operation. A number of illustrative examples are worked out in detail.

THE FIRST 150 YEARS, by the House of Wiley. John Wiley & Sons, New York, N.Y. 242 pages, $7.50.

This volume, beautifully designed and bound, is a history of the growth of the Wiley firm since 1807 and of the books it has published, largely in the fields of science and technology.

Because the subject matter of the books Wiley & Sons have published is very diverse, specialists in each subject, particularly those with a wide knowledge of the bibliography of that subject, were needed to write an authoritative history of the firm.

The book also describes the people responsible for Wiley & Sons' past publishing ventures, giving some of the problems they faced and some of the ambitions they realized.

Special credit must be given to Martin Matheson, senior vice president and secretary of John Wiley & Sons, for the major role he played in making this book possible.

HIGH SPEED FLIGHT, by E. Ower and J. Nayler. Philosophical Library, New York, N.Y. 227 pages, $10.00.

This book deals with the special problems found in high-speed and supersonic flight, including information not previously released for general publication.

First, the authors explain the fundamentals of flight, followed by an account of how successive difficulties were met and overcome and of the inauguration of a new era: breaking of the sound barrier. Research and experiments in aerodynamics and the use of wind-tunnels are clearly described. Also, some account is given of modern rockets and guided missiles, as many of the problems encountered in supersonic flight are as important to rocketry as to aeronautics.

The authors, both of whom are well-known experts in aeronautical research, also review the physiological problems of high-speed flight and assess some of its future possibilities. The style of the book is clear and factual. Illustrations and charts are plentiful, and technicalities are reduced to a minimum.

GLOBAL STRATEGY, by E. J. Kingston-McCloughry. Frederick A. Praeger, Inc., New York, N.Y. 270 pages, $4.50.

Global Strategy, together with the earlier *The Direction of War* by the same author, has been called a new and important contribution to military science.

The author first reviews the evolution of war and the transition from classical to modern strategy. He then deals with the strategic importance of the world's various geographical zones, followed by a detailed analysis of strategy, including Allied, National, Theatre and Service concepts.

The book advocates Allied responsibility for solving strategic difficulties, and relates National and Service strategies to this problem. The roles and functions of the Services are clarified and new methods and weapons are discussed.

In conclusion, the author states the facts of the contemporary strategic situation, advocating principles and a method of solving Allied strategical problems in order to make the Western world master of that situation.

TRANSISTOR TECHNIQUES, published by Gernsback Library, Inc., New York, N.Y. $1.50, 96 pages.

The booklet is a collection of material, originally presented in *Radio-Electronics Magazine*, and presents the next step for those who have already begun studying transistor theory.

UMI

The practical applications of transistors are also discussed. Transistor performance, tests, and checks are explained in considerable detail. The manual includes chapters on the transistor dc transformer, oscillators and triggers, and the Geiger counter.

MANUFACTURING METHODS AND PROCESSES, by Arthur C. Ansley. The Chilton Co., Philadelphia, Pa. 561 pages, $12.50.

Here is a concise yet varied summary, in one volume, of the newest developments in manufacturing methods, their end products and economics.

The book's main purpose is to give the executive, the purchasing agent, the design engineer and others interested in manufacturing production and design a broad, general background in the latest developments in manufacturing methods and processes. The book is an excellent text and reference book for technical, vocational and college courses.

The volume describes briefly the methods and equipment used in the various manufacturing processes. It features over 450 illustrations. It places its principal emphasis on the kind of parts, plus their chief application and cost, made by each process. Special attention is given such new developments as plastics, power metallurgy, investment casting, ultrasonic machining, dielectric heating, automation and electronic printed circuits. Especially to be noted is the chapter on assembly production, which emphasizes tremendous savings to be made on this phase of manufacturing.

THE OFFICER'S GUIDE, 23rd Edition. Compiled by the Military Service Publishing Co., Harrisburg, Pa. 505 pages, $5.00.

The Officer's Guide is a convenient reference on customs and correct procedures pertaining to U. S. Army commissioned officers.

A new edition of the book was made necessary by important changes in Army regulations which became effective this year. They include the new uniforms, increased survivor benefits, contributory Social Security, the Family Medical Plan, a new efficiency report, the new "Pentomic" organization, and other items. A number of chapters have been extensively revised to include these important new developments.

This illustrated, up-to-date volume continues to provide a variety of information on today's officer needs.

THE HISTORY OF GERMANY FROM THE REFORMATION TO THE PRESENT DAY, by Prof. Minna R. Falk. Philosophical Library, New York, N. Y. 438 pages, $6.00.

This text deals with four centuries of German history, emphasizing factual material essential to the reader's understanding of modern Germany.

The author stresses political and economic factors and their effect upon the German people. Included is a full discussion of the present government of the Federal Republic, the situation in Eastern Germany, and a summary of Germany's many unsolved problems.

Professor Falk has served three years with the military government in Germany and Austria.

AN INTRODUCTION TO SEMICONDUCTORS, by W. C. Dunlap, Jr. John Wiley & Sons, Inc., New York. 417 pages, $11.75.

This book is said to be the first single volume on semiconductors to give a complete coverage of the subject. Included are basic concepts, properties of materials, methods of measurement, and applications. Designed to prepare the reader for active work in the field of semiconductors, this study provides a source of general information on all phases.

The approach of the book is almost entirely physical, with emphasis on mechanisms and modes of operation. The author minimizes formal theory and minute detail wherever possible.

ELEMENTS OF COLOR IN PROFESSIONAL MOTION PICTURES, edited by Wilton R. Holm. Society of Motion Picture and Television Engineers, New York. 104 pages, $3.50.

This book is intended to provide authoritative help in the use of color to the producers and buyers of theatrical, industrial, educational and television films. It is also of interest to engineers and amateur photographers.

The volume's twelve chapters take up such topics as: characteristics of color, color films and processes, photographing a motion picture in color, special effects, color processing and printing, and the relationship of motion pictures and color television.

Members of a special committee under the SMPTE Color Committee contributed their specialized knowledge of motion picture and TV production. 27 pages of color illustrations supplement the text.

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